RCA TUBE
HANDBOOK
HB-3

CATHODE-RAY TUBE, STORAGE TUBE, & MONOSCOPE SECTION

This Section contains data for black-and-white 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.

SELECTION GUIDE FOR RCA PICTURE TUBES

Black-and-White Picture Tubes

Deflection Angle Degrees	Heater Volts/Ma	Focus-ing Method	Design-Maximum Anode Volts	RCA Type
ELECTROSTATIC DEFLECTION TYPE				
Round Glass Envelope				
	6.3/600	E	6500	7JP4
MAGNETIC DEFLECTION TYPES				
Round Glass Envelope				
50	6.3/600	M	13,000	10BP4A
50	6.3/600	M	13,000	10FP4A
52	6.3/600	M	15,500	16LP4A
54	6.3/600	M	13,000	12KP4A
60	6.3/600	M	16,500	16DP4A
70	6.3/600	M	17,500	16WP4A
Round Metal Envelope				
53	6.3/600	M	15,500	16AP4A
66	6.3/600	M	17,500	19AP4B
70	6.3/600	M	15,500	16GP4B
Rectangular Metal Envelope				
70	6.3/600	M	17,500	17CP4
70	6.3/600	E	17,500	17GP4
70	6.3/600	E	17,500	17TP4
70	6.3/600	M	20,000	21AP4
70	6.3/600	E	17,500	21MP4
90	6.3/600	M	20,000	27MP4

E = Electrostatic

M = Magnetic

Black-and-White Picture Tubes

Deflection Angle Degrees	Heater Volts/Ma	Focus-ing Method	Design-Maximum Anode Volts	RCA Type
MAGNETIC DEFLECTION TYPES - (Cont'd)				
Rectangular Glass Envelope				
Conventional Rectangular Glass Types				
70	4.7/300	E	7500	9QP4A
70	6.3/600	M	15,500	14CP4B
70	6.3/600	E	12,000	14QP4B
70	6.3/600	M	15,500	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	17LP4B[a]
70	6.3/600	M	20,000	17QP4B
70	6.3/600	M	20,000	20DP4D
70	6.3/600	E	17,500	20HP4E
70	6.3/600	M	20,000	21EP4C[a]
70	6.3/600	E	20,000	21FP4D[a]
70	6.3/600	M	20,000	21WP4B
70	6.3/600	E	20,000	21XP4B
70	6.3/600	E	20,000	21YP4B
70	6.3/600	M	20,000	21ZP4C
72	6.3/600	E	22,000	21AVP4C
72	6.3/600	M	20,000	21AWP4A
90	6.3/600	E	9000	8DP4

[a] Cylindrical Faceplate

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Black-and-White-Picture Tubes

Deflection Angle Degrees	Heater Volts/Ma	Focus-ing Method	Design-Maximum Anode Volts	RCA Type
Rectangular Glass Envelope Cont'd				
Conventional Rectangular Glass Types				
90	8.4/450	E	15,500	14ATP4
90	6.3/600	E	15,500	14WP4
90	6.3/600	E	17,500	17BJP4
90	6.3/600	E	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
90	6.3/600	E	22,000	21DLP4
90	6.3/600	E	22,000	21DSP4[b]
90	6.3/600	E	22,000	24AEP4
90	6.3/600	E	22,000	24ATP4[b]
90	6.3/600	E	22,000	24AUP4
90	6.3/600	M	22,000	24CP4B
90	6.3/600	M	22,000	27RP4A
90	6.3/600	E	20,000	27VP4
90	6.3/600	E	23,000	27XP4
92	6.3/600	E	20,000	19BDP4[b]
92	6.3/600	E	22,000	23AHP4
92	6.3/600	E	22,000	23ASP4
92	6.3/600	E	22,000	23AWP4[b]
92	6.3/600	E	25,000	23BJP4[b]
92	6.3/450	E	22,000	23CGP4

[b] Low G_2 Type [c] Internal Magnetic Shield

PICTURE TUBES

PICTURE TUBES

Black-and-White Picture Tubes

Deflection Angle Degrees	Heater Volts/Ma	Focus-ing Method	Design-Maximum Anode Volts	RCA Type
Rectangular Glass Envelope Cont'd				
Conventional Rectangular Glass Types				
94	6.3/600	E	23,000	23DAP4[b]
110	8.4/450	E	17,500	17CDP4
110	6.3/600	E	17,500	17CSP4
110	2.68/450	E	17,500	17DAP4
110	6.3/600	E	23,000	17DKP4
110	6.3/450	E	17,500	17DQP4[b]
110	2.68/450	E	17,500	17DRP4[c]
110	6.3/600	E	20,000	17DSP4
110	6.3/450	E	17,500	17DXP4
110	6.3/600	E	20,000	21CQP4
110	6.3/600	E	22,000	21DEP4A
110	6.3/600	E	20,000	21DFP4
110	6.3/450	E	20,000	21DHP4
110	6.3/600	E	20,000	21EQP4
110	2.68/450	E	20,000	21EVP4[c]
110	6.3/600	E	22,000	21FAP4
110	6.3/600	E	20,000	21FDP4
110	6.3/600	E	22,000	23DBP4[b]
110	6.3/600	E	22,000	24AHP4
110	6.3/600	E	22,000	24BAP4[b]
110	6.3/600	E	20,000	24BEP4
114	6.3/600	E	18,000	16ANP4
114	6.3/450	E	20,000	16AYP4

SELECTION GUIDE FOR RCA PICTURE TUBES

Black-and-White Picture Tubes

Deflection Angle Degrees	Heater Volts/Ma	Focusing Method	Design-Maximum Anode Volts	RCA Type
Rectangular Glass Envelope Cont'd				
Conventional Rectangular Glass Types				
114	2.68/450	E	20,000	19ABP4
114	6.3/450	E	17,500	19AHP4
114	6.3/450	E	20,000	19AJP4[b]
114	6.3/600	E	23,000	19AVP4
114	6.3/450	E	23,000	19AYP4
114	6.3/600	E	23,000	19BTP4
114	6.3/600	E	20,000	19CHP4[b]
114	6.3/600	E	22,000	19CKP4[b]
114	6.3/450	E	20,000	19CMP4[b]
114	6.3/600	E	20,000	19XP4
114	6.3/600	E	20,000	19YP4
114	6.3/450	E	22,000	23ALP4
114	6.3/450	E	23,500	23CQP4
114	6.3/600	E	23,500	23FP4A
114	6.3/600	E	22,000	23MP4
114	6.3/600	E	22,000	23NP4[b]
Bi-Panel Rectangular Glass Types				
92	6.3/600	E	22,000	23DBP4[d]
92	6.3/600	E	25,000	23BLP4[e]
92	6.3/600	E	25,000	23BTP4
92	6.3/600	E	22,000	23YP4

[b] Low G_2 Type [d] Faceplate Treated

[e] Low G_2 Type, Faceplate Treated

Black-and-White Picture Tubes

Deflection Angle Degrees	Heater Volts/Ma	Focusing Method	Design-Maximum Anode Volts	RCA Type
MAGNETIC DEFLECTION TYPES Cont'd				
Bi-Panel Rectangular Glass Types Cont'd				
110	6.3/600	E	22,000	23BGP4[b]
110	6.3/450	E	23,000	23BQP4
110	6.3/450	E	23,000	23CBP4[d]
110	6.3/600	E	22,000	23CP4
110	6.3/600	E	23,500	23CP4A
110	6.3/600	E	22,000	23EP4[b]
110	6.3/600	E	22,000	23GP4
110	6.3/450	E	22,000	23JP4[b]
114	6.3/600	E	20,000	19AFP4[d]
114	6.3/600	E	20,000	19AUP4[d]
Pan-O-Ply Rectangular Glass Types				
92	6.3/450	E	25,000	23EKP4
92	6.3/600	E	25,000	23ENP4
92	6.3/600	E	25,000	23FBP4[d]
110	6.3/600	E	23,000	23ETP4
110	6.3/450	E	23,000	23FDP4[b]
110	6.3/450	E	23,000	23FMP4
114	6.3/450	E	20,000	16BGP4
114	6.3/450	E	23,000	19DQP4
114	6.3/600	E	23,000	19DRP4
114	6.3/600	E	20,000	19DSP4[b]
114	6.3/600	E	18,000	19EHP4A
114	6.3/450	E	23,000	23EQP4

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Color Picture Tubes

Deflection Angle Degrees	Heater Volts/Ma	Focusing Method	Design-Maximum Anode Volts	RCA Type
ROUND GLASS ENVELOPE				
Conventional Types				
45	6.3/1800	E	22,000	15GP22
70	6.3/1800	E	27,500	21CYP22A
70	6.3/1800	E	27,500	21FBP22
70	6.3/1800	E	27,500	21FBP22A[f]
Integral Protective Window Types				
70	6.3/1800	E	27,500	21FJP22[d]
70	6.3/1800	E	27,500	21FJP22A[f]
70	6.3/1800	E	27,500	21FKP22
ROUND METAL ENVELOPE				
70	6.3/1800	E	27,500	21AXP22A
RECTANGULAR GLASS ENVELOPE				
Conventional Types				
90	6.3/800	E	27,500	25BP22
90	6.3/800	E	27,500	25BP22A[f]
Integral Protective Window Type				
90	6.3/800	E	27,500	25AP22
90	6.3/800	E	27,500	25AP22A[f]

[f] Hi-Lite type, features rare-earth red-emitting phosphor.

Test Picture Tubes

Deflection Angle Degrees	Heater Volts/Ma	Focusing Method	Design-Maximum Anode Volts	RCA Type
ROUND GLASS ENVELOPE				
53	6.3/600	E	20,000	5AXP4
RECTANGULAR GLASS ENVELOPE				
90	6.3/600	E	22,000	8XP4
110	6.3/600	E	22,000	8YP4

PICTURE TUBES

PICTURE TUBES

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CATHODE-RAY TUBE, STORAGE TUBE, & MONOSCOPE CLASSIFICATION CHART

SPECIAL-PURPOSE KINESCOPES

Approx. Bulb Dia. Inches	Focusing Method	Deflection Method	Minimum Screen Size Inches	Maximum Ultor Volts*	TUBE TYPE
Monitor Types					
7	M	M	6 Diameter	10000	7QP4
7	E	M	6 Diameter*	12000	7TP4
10	E	M	9-1/8 Diameter*	20000	10SP4
Projection Types					
5	E	M	4-1/4 Diameter■*	40000†	5AZP4
5	E	M	4-1/4 Diameter●*	27000	5TP4
7	E	M	5 x 3-3/4◆*	80000†	7NP4
7	E	M	5 x 3-3/4◆*	80000†	7WP4
View-Finder Types					
5	E	M	4-1/4 Diameter*	10000	5AYP4
5	M	M	4-1/4 Diameter	8000	5FP4-A
Transcriber Type					
5	E	M	4-1/4 Diameter*	27000	5WP11

STORAGE TUBES

Name	Description	TUBE TYPE
Radechon	Single-Beam, Barrier-Grid Type	6499
Computer	Single-Beam, Primary-Current-Modulation Type	6571
Display	Direct-View, 5-Inch, 2-Gun Type with Electrostatically Deflected Writing Beam	6866
Display	Direct-View, 5-Inch, 2-Gun Type with Magnetically Deflected Writing Beam	7183
Graphechon	Signal-Converter Type with Reading Gun and Writing Gun	6896/1855

* Design-center values except as noted.

* Type having aluminized screen.

■ Quality-circle diameter of faceplate. When used with suitable reflective optical system, the 5AZP4 provides an 8" x 6" picture.

† Absolute value.

● Quality-circle diameter of faceplate. When used with suitable reflective optical system, the 5TP4 provides a 24" x 18" picture.

◆ Quality rectangle of faceplate. When used with suitable reflective optical system, the 7NP4 provides a 20" x 15" picture at a projection-throw distance of 60".

◆ Like footnote ◆ except projection-throw distance is 80".

E = Electrostatic.

M = Magnetic.

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

CATHODE-RAY TUBE, STORAGE TUBE, & MONOSCOPE CLASSIFICATION CHART

FLYING-SPOT CATHODE-RAY TUBES

Approx. Bulb Dia. Inches	Focusing Method	Deflection Method	Phosphor□	Maximum Ultor Volts●	TUBE TYPE
Black-and-White Television Types					
5	E	M	P15	27000	5WP15
5	E	M	P16	27000	5ZP16
Color-Television Type					
5	E	M	P24	27000	5AUP24

MONOSCOPES

Approx. Bulb Dia. Inches	Focusing Method	Deflection Method	Feature	Maximum Ultor Volts●	TUBE TYPE
5	E	M	Resolution Chart	1500	2F21

□ See sheet FEATURES OF FLUORESCENT SCREENS.
● Design-center values.
E = Electrostatic.
M = Magnetic.

Key to Replacement Information

Replacement information is based primarily on electrical and mechanical similarity of the picture-tube types covered. Replacement should be 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. External conductive coating must be grounded.

E. The 16LP4A is electrically interchangeable—Extensive mechanical modifications may be required.

F. The RCA replacement type has a 6.3-volt/600-milliampere heater. The type to be replaced has a 2.35-volt/600-milliampere heater.

G. A conversion Kit (RCA Part No.12B202) is available for RCA receivers.

* Band around periphery of tube panel must be grounded and isolated from the AC line voltage.

Type to be Replaced	Replace by RCA Type	Replacement[□]
5TP4	5TP4	Direct
7JP4	7JP4	Direct
8DP4	8DP4	Direct
9QP4A	9QP4A	Direct
10BP4 10BP4A	10BP4A	Direct
10BP4C 10BP4D	10FP4A	A
10CP4	10FP4A	BCD
10EP4	10BP4A	B
10FP4 10FP4A	10FP4A	Direct
11AP4 11BP4	11HP4A	Direct*
11CP4	11CP4	Direct
11HP4 11HP4A	11HP4A	Direct*
12BNP4 12BNP4A	12BNP4A	Direct*
12JP4	12KP4A	BCD
12KP4 12KP4/ 12ZP4 12KP4A	12KP4A	Direct
12LP4 12LP4A	12KP4A	A
12LP4C	12KP4A	AD
12QP4 12QP4A	12KP4A	ABCD
12TP4	12KP4A	AD
12ZP4 12ZP4A	12KP4A	A
14ATP4	14ATP4	Direct
14BP4 14BP4A 14CP4 14CP4A	14CP4B	A
14CP4B	14CP4B	Direct
14DP4	14CP4B	AD

□See *Key to Replacement Information* in front of this section.

Picture-Tube Replacement Guide

Type to be Replaced	Replace by RCA Type	Replacement[□]
14EP4 14EP4/ 14CP4 14EP4/ 14CP4/ 14BP4	14CP4B	A
14NP4 14NP4A	14WP4	A
14RP4 14RP4A 14SP4	14WP4	A
14WP4 14WP4/ 14ZP4 14ZP4 14ZP4/ 14WP4	14WP4	Direct
16ANP4	16ANP4	Direct
16AP4 16AP4A	See Note E	
16AYP4	16AYP4	Direct
16BGP4 16BWP4 16CAP4	16BGP4	Direct*
16CP4	16LP4A	CD
16DP4 16DP4A	16DP4A	Direct
16GP4 16GP4A 16GP4B 16GP4C	16GP4B	Direct
16KP4 16KP4A	16RP4B	A
16LP4 16LP4A	16LP4A	Direct
16QP4	16RP4B	AD
16RP4 16RP4/ 16KP4 16RP4A 16RP4A/ 16KP4A	16RP4B	A
16RP4B	16RP4B	Direct
16SP4 16SP4A	16WP4A	CD
16TP4	16TP4	Direct
16UP4	16RP4B	ACD
16VP4	16WP4A	CD
16WP4 16WP4/ 16YP4	16WP4A	D
16WP4A 16WP4B	16WP4A	Direct
16XP4	16RP4B	AD
16YP4	16WP4A	CD
16ZP4	16LP4A	D
17AP4	17BP4D	ACD
17ATP4 17ATP4/ 17AVP4 17ATP4A 17ATP4A/ 17AVP4A 17AVP4 17AVP4/ 17ATP4 17AVP4A 17AVP4A/ 17ATP4A	17BJP4	A
17BJP4	17BJP4	Direct
17BP4	17BP4D	AD
17BP4A 17BP4B 17BP4C	17BP4D	A
17BP4D	17BP4D	Direct
17BRP4	17DSP4	A
17BUP4	17BJP4	A
17BVP4	17CSP4	A
17BWP4	17CSP4	Direct
17BZP4 17BZP4/ 17CAP4/ 17CKP4	17DSP4	Direct

□See *Key to Replacement Information* in front of this section.

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Type to be Replaced	Replace by RCA Type	Replacement[1]
17BZP4/ 17CAP4/ 17CKP4/ 17BRP4 17CAP4	17DSP4	Direct
17CBP4	17BJP4	A
17CDP4	17CDP4	Direct
17CFP4	17CFP4	Direct
17CKP4	17DSP4	Direct
17CLP4	17BJP4	AD
17CP4 17CP4A	17CP4	Direct
17CSP4	17CSP4	Direct
17CWP4	17DSP4	Direct
17CYP4	17CYP4	Direct
17DAP4	17DAP4	Direct
17DHP4	17EFP4	D
17DKP4	17DKP4	Direct
17DLP4	17DSP4	Direct
17DQP4	17DQP4	Direct
17DRP4	17DRP4	Direct
17DSP4	17DSP4	Direct
17DTP4	17DKP4	Direct
17DXP4 17DZP4	17DXP4	Direct
17EBP4	17EFP4	D
17EFP4	17EFP4	Direct
17GP4	17GP4	Direct
17HP4 17HP4/ 17RP4 17HP4A 17HP4B 17HP4B/ 17RP4C	17HP4C	A
17HP4C	17HP4C	Direct
17JP4	17BP4D	A
17PL4 17LP4/ 17VP4	17LP4B	A
17LP4A 17LP4A/ 17VP4B	17LP4B	A
17LP4B	17LP4B	Direct
17QP4 17QP4A	17QP4B	A
17QP4B	17QP4B	Direct
17RP4 17RP4C	17HP4C	A
17TP4	17TP4	Direct
17UP4	17QP4B	A
17VP4 17VP4/ 17LP4 17VP4B	17LP4B	A
17YP4	17QP4B	A
19ABP4	19ABP4	Direct
19ACP4	19CHP4	Direct
19AFP4	19AUP4	Direct
19AHP4	19AHP4	Direct
19AJP4	19AJP4	Direct
19AUP4	19AUP4	Direct
19AVP4	19AVP4	Direct
19AXP4 19AYP4	19AYP4	Direct
19BDP4	19BDP4	Direct
19BHP4	19AVP4	Direct
19BLP4	19AVP4	C
19BTP4	19BTP4	Direct
19BVP4	19AVP4	Direct
19BWP4	19AYP4	Direct
19CDP4	19CXP4	Direct
19CFP4	19CHP4	C
19CHP4	19CHP4	Direct
19CJP4	19AVP4	Direct
19CKP4	19CHP4	Direct
19CMP4 19CMP4A	19CMP4	Direct
19CQP4	19CXP4	Direct

[1] See *Key to Replacement Information* in front of this section.

Picture-Tube Replacement Guide

Type to be Replaced	Replace by RCA Type	Replacement[□]
19CRP4	19BDP4	Direct
19CXP4	19CXP4	Direct
19CYP4	19BTP4	Direct
19CZP4 19DAP4	19DAP4	Direct
19DCP4	19DRP4	Direct*
19DEP4	19AUP4	Direct
19DFP4	19CHP4	Direct
19DHP4	19DSP4	Direct*
19DLP4	19CHP4	Direct
19DQP4	19DQP4	Direct*
19DRP4	19DRP4	Direct*
19DSP4	19DSP4	Direct*
19DWP4	19DQP4	Direct*
19EDP4	19DRP4	Direct*
19EFP4	19DSP4	Direct*
19EHP4 19EHP4A	19DRP4	Direct*
19ELP4	19AVP4	Direct
19ERP4	19DRP4	Direct*
19ESP4	19DSP4	Direct*
19EUP4	19DRP4	Direct*
19EVP4 19EWP4 19FDP4 19FJP4 19FJP4A	19DQP4	Direct*
19XP4	19AVP4	Direct
19YP4	19BTP4	Direct
19ZP4	19AVP4	Direct
20CP4	20DP4D	ACD
20CP4A	20DP4D	AC
20CP4B 20CP4C	20DP4D	ACD
20CP4D	20DP4D	AC
20DP4	20DP4D	AD
20DP4A 20DP4A/ 20CP4A	20DP4D	A
20DP4B	20DP4D	AD
20DP4C 20DP4C/ 20CP4D	20DP4D	A
20DP4D	20DP4D	Direct
20HP4	20HP4E	AD
20HP4A 20HP4A/ 20LP4 20HP4A/ 20MP4	20HP4E	A
20HP4B 20HP4C	20HP4E	AD
20HP4D	20HP4E	A
20HP4E	20HP4E	Direct
20LP4 20MP4	20HP4E	A
21ACP4 21ACP4/ 21AMP4 21ACP4A 21ACP4A/ 21AMP4A 21ACP4A/ 21BSP4 21ACP4A/ 21BSP4/ 21AMP4A	21AMP4B	A
21AFP4	21YP4B	AD
21ALP4 21ALP4A 21ALP4B 21ALP4B/ 21ALP4A	21CBP4A	AD
21AMP4 21AMP4A	21AMP4B	A
21AMP4B	21AMP4B	Direct
21ANP4 21ANP4A	21CBP4A	AD
21AP4	21AP4 21ZP4C	Direct G
21AQP4 21AQP4A	21AMP4B	AD

□See *Key to Replacement Information* in front of this section.

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Type to be Replaced	Replace by RCA Type	Replacement[□]
21ASP4	21XP4B	AD
21ATP4 21ATP4A 21ATP4A/ 21ATP4 21ATP4B	21CBP4A	AD
21AUP4 21AUP4A 21AUP4B 21AUP4B/ 21AUP4A	21AVP4C	A
21AUP4C	21AVP4C	Direct
21AVP4 21AVP4/ 21AUP4 21AVP4A 21AVP4B 21AVP4B/ 21AVP4A 21AVP4B/ 21AUP4B/ 21AVP4A/ 21AUP4A	21AVP4C	A
21AVP4C	21AVP4C	Direct
21AWP4	21AWP4A	A
21AWP4A	21AWP4A	Direct
21AYP4	21XP4B	A
21BAP4	21CBP4A	Direct
21BCP4	21YP4B	AC
21BDP4	21AVP4C	Direct
21BNP4	21CBP4A	Direct
21BSP4	21AMP4B	A
21BTP4	21CBP4A	A
21CBP4 21CBP4A 21CBP4A/ 21CBP4/ 21CMP4 21CBP4B	21CBP4A	Direct
21CEP4	21DFP4	Direct
21CEP4A	21DFP4	Direct
21CMP4	21CBP4A	A
21CQP4	21CQP4	Direct
21CUP4	21AMP4B	A
21CVP4	21CBP4A	Direct
21CWP4	21CBP4A	A
21CXP4	21DSP4	Direct
21CZP4	21DEP4A	A
21DAP4 21DEP4 21DEP4A 21DEP4A/ 21DEP4/ 21CZP4	21DEP4A	Direct
21DFP4	21DFP4	Direct
21DHP4	21DHP4	Direct
21DLP4	21DLP4	Direct
21DMP4	21FAP4	Direct
21DNP4	21CBP4A	AD
21DQP4	21DLP4	Direct
21DSP4	21DSP4	Direct
21EAP4	21FDP4	F
21EMP4	21EQP4	Direct
21EP4	21EP4C	AD
21EP4A 21EP4B	21EP4C	A
21EP4C	21EP4C	Direct
21EQP4	21EQP4	Direct
21ESP4	21FAP4	Direct
21EVP4	21EVP4	Direct
21FAP4	21FAP4	Direct
21FDP4	21FDP4	Direct
21FLP4	21CBP4A	Direct
21FP4	21FP4D	AD
21FP4A 21FP4C	21FP4D	A
21FP4D	21FP4D	Direct
21FVP4 21FWP4 21FZP4	21FVP4	Direct*
21MP4	21MP4	Direct
21WP4 21WP4A	21WP4B	A

□See *Key to Replacement Information* in front of this section.

Picture-Tube Replacement Guide

Type to be Replaced	Replace by RCA Type	Replacement[□]
21WP4B	21WP4B	Direct
21XP4 21XP4A	21XP4B	A
21XP4B	21XP4B	Direct
21YP4 21YP4A	21YP4B	A
21YP4B	21YP4B	Direct
21ZP4	21ZP4C	AD
21ZP4A 21ZP4B	21ZP4C	A
21ZP4C	21ZP4C	Direct
23AFP4	23YP4	Direct
23AHP4	23AHP4	Direct
23ALP4	23CQP4	Direct
23ANP4	23BPL4	Direct
23ARP4	23ARP4	Direct
23ASP4	23ASP4	Direct
23ATP4	23BLP4	Direct
23AUP4	23AHP4	Direct
23AVP4	23CP4	C
23AWP4	23BJP4	C
23BDP4	23YP4	Direct
23BGP4 23BHP4	23BGP4	Direct
23BJP4	23BJP4	Direct
23BKP4 23BLP4	23BLP4	Direct
23BNP4	23CP4	Direct
23BQP4	23BQP4	Direct
23BTP4 23BVP4	23YP4	Direct
23CBP4	23CBP4	Direct
23CGP4	23CGP4	Direct
23CP4 23CP4A	23CP4	Direct
23CQP4	23CQP4	Direct
23CZP4	23AHP4	Direct
23DAP4	23DAP4	Direct
23DBP4	23DBP4	Direct
23DLP4 23DLP4A	23ENP4	C*
23DNP4	23BLP4	Direct
23DYP4	23ETP4	D*
23DZP4	23EQP4	Direct*
23EKP4	23EKP4	Direct*
23ENP4	23ENP4	Direct
23EP4	23EP4	Direct
23EQP4	23EQP4	Direct*
23ETP4	23ETP4	Direct*
23EWP4 23EWP4A	23EQP4	Direct*
23FBP4	23FBP4	Direct*
23FFP4	23ENP4	Direct*
23FJP4	23ETP4	D*
23FLP4	23EKP4	Direct*
23FMP4	23FMP4	Direct*
23FP4 23FP4A	23FP4A	Direct
23GBP4	23FMP4	Direct*
23GEP4	23FBP4	Direct*
23GP4	23CP4	Direct
23GTP4	23ETP4	Direct*
23HP4	23CP4	Direct
23JP4	23JP4	Direct
23KP4 23KP4A	23FP4A	C
23MP4 23MP4/ 23MP4A/ 23WP4 23MP4A	23FP4A	Direct
23NP4	23NP4	Direct
23TP4	23YP4	Direct
23UP4	23BQP4	Direct
23WP4	23FP4A	Direct
23XP4 23YP4	23YP4	Direct

□See *Key to Replacement Information* in front of this section.

Picture-Tube Replacement Guide

Type to be Replaced	Replace by RCA Type	Replacement[□]
24ADP4 24ADP4/ 24VP4A/ 24CP4A/ 24TP4	24CP4B	A
24AEP4	24AEP4	Direct
24AHP4	24AHP4	Direct
24AJP4	24ATP4	D
24ALP4	24AHP4	Direct
24ANP4	24AEP4	A
24ATP4	24ATP4	Direct
24AUP4	24AUP4	Direct
24AVP4	24BEP4	F
24BAP4	24BAP4	Direct
24BEP4	24BEP4	Direct
24CP4 24CP4A	24CP4B	A
24CP4B	24CP4B	Direct
24DP4 24DP4A 24DP4A/ 24YP4	24AEP4	A
24QP4	24CP4B	AD
24TP4 24VP4 24VP4A	24CP4B	A
24XP4	24CP4B	AD
24YP4	24AEP4	A
24ZP4	24AEP4	Direct
27EP4	27RP4A	AD
27GP4	27RP4A	AD
27MP4	27MP4	Direct
27NP4 27RP4	27RP4A	A
27RP4A	27RP4A	Direct
SG10FP4A	10FP4A	Direct
SG12KP4A	12KP4A	Direct
SG14CP4A	14CP4B	Direct
SG14WP4	14WP4	Direct
SG16KP4A	16RP4B	Direct
SG17BJP4	17BJP4	Direct
SG17BP4B	17BP4D	Direct
SG17BWP4	17CSP4	Direct
SG17CKP4	17DSP4	Direct
SG17HP4B	17HP4C	Direct
SG17LP4A	17LP4B	Direct
SG17QP4A	17QP4B	Direct
SG20CP4D	20DP4D	C
SG20HP4D	20HP4E	Direct
SG21ACP4A	21AMP4B	Direct
SG21AUP4B	21AVP4C	Direct
SG21AWP4	21AWP4A	Direct
SG21DEP4A	21DEP4A	Direct
SG21EP4B	21EP4C	Direct
SG21FLP4	21CBP4A	Direct
SG21FP4C	21FP4D	Direct
SG21WP4A	21WP4B	Direct
SG21XP4A	21XP4B	Direct
SG21YP4A	21YP4B	Direct
SG21ZP4B	21ZP4C	Direct
SG24AEP4	24AEP4	Direct
SG24CP4A	24CP4B	Direct
SG27RP4	27RP4A	Direct

COLOR PICTURE TUBES

15GP22	15GP22	Direct
19EYP22 19FMP22	19EYP22	Direct
21AXP22 21AXP22A 21AXP22A/ 21AXP22	21AXP22A	Direct
21CYP22 21CTP22A	21CYP22A	Direct
21FBP22	21FBP22	Direct
21FBP22A	21FBP22A	Direct
21FJP22	21FJP22	Direct
21FJP22A	21FJP22A	Direct
21FKP22	21FJP22	Direct

□See *Key to Replacement Information* in front of this section.

Picture-Tube Replacement Guide

Type to be Replaced	Replace by RCA Type	Replacement[□]
25AP22 25AP22A	25AP22A	Direct
25BP22 25BP22A	25BP22A	Direct
25CP22	25AP22A	Direct
25FP22 25FP22A	25BP22A	Direct
25GP22A 25GP22A	25AP22A	Direct

[□]See *Key to Replacement Information* in front of this section.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

FEATURES OF FLUORESCENT SCREENS

The fluorescent screens of the cathode-ray tubes covered in this Section are identified according to phosphor number, e.g., P1, P2, P4, P5, P7, etc.

Phosphor P1 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- or medium-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 phosphor are 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.

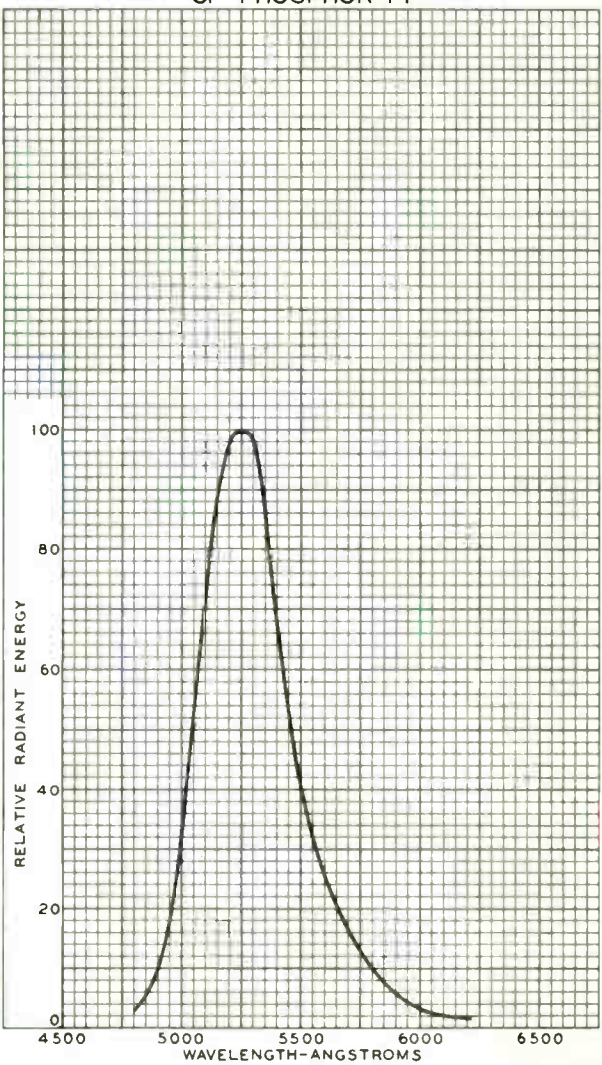
Phosphor P20 has high luminous efficiency, yellow-green fluorescence and medium-short persistence. The screen may be used in applications requiring relatively short persistence and good visual efficiency.

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.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P1

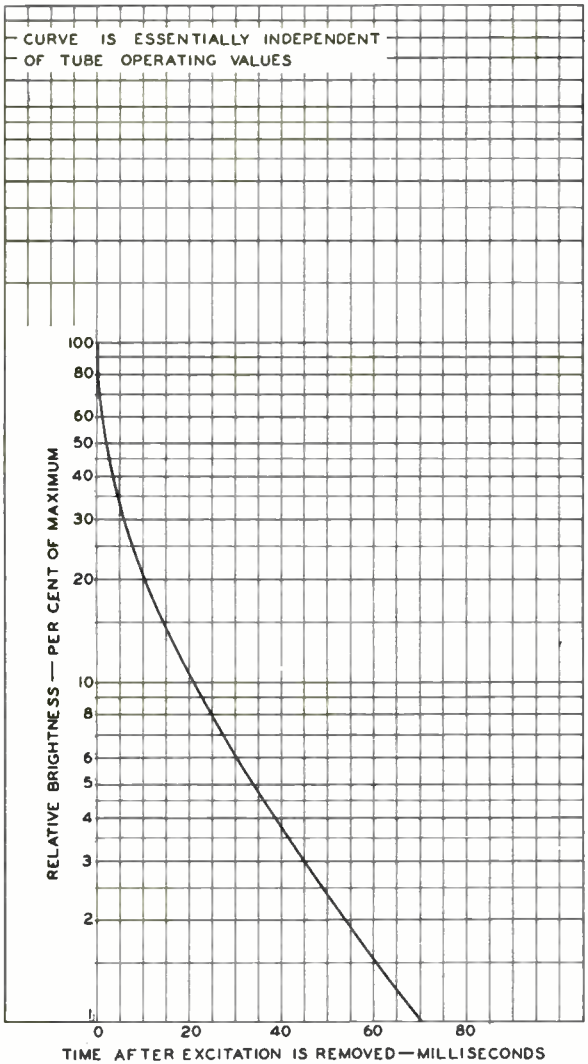


DEC. 14, 1948

TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

92CM-5372R1

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P1

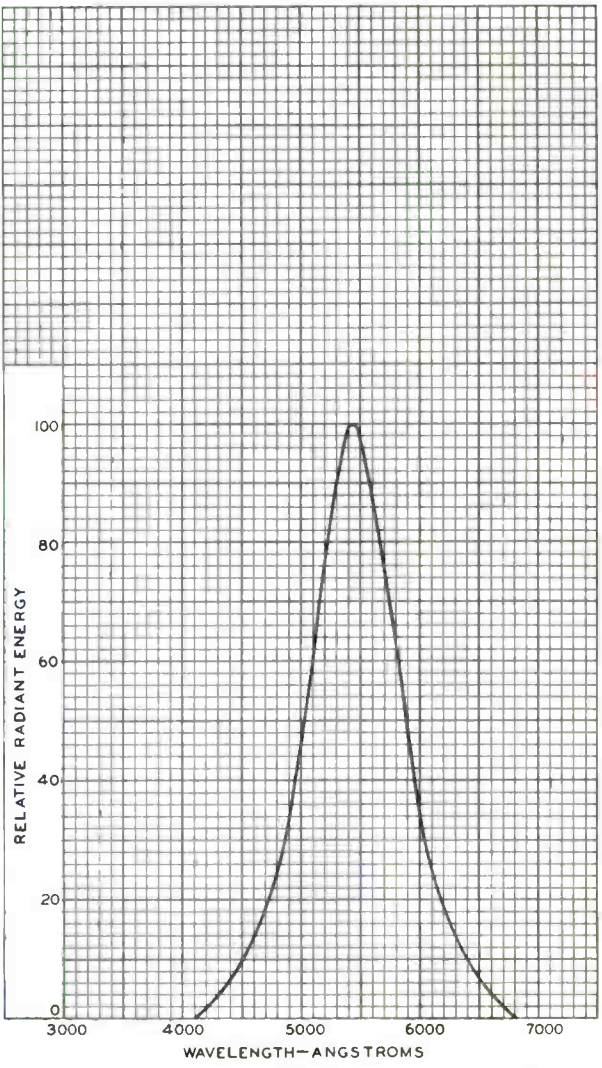


FEB. 1, 1951

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-5380R2

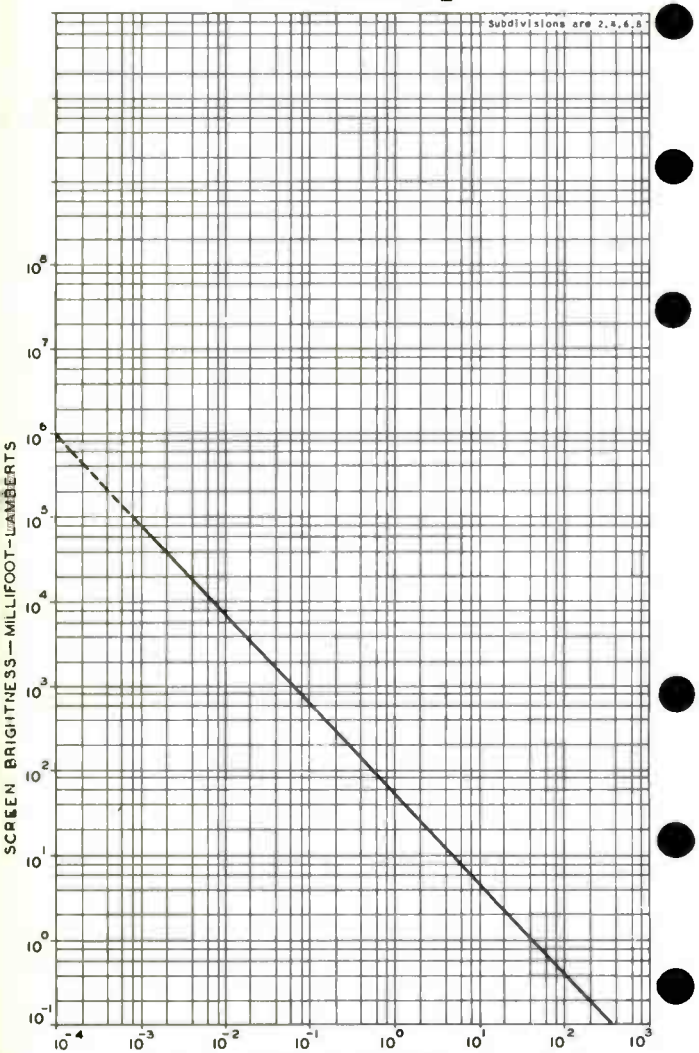
SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P2



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7312

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P2

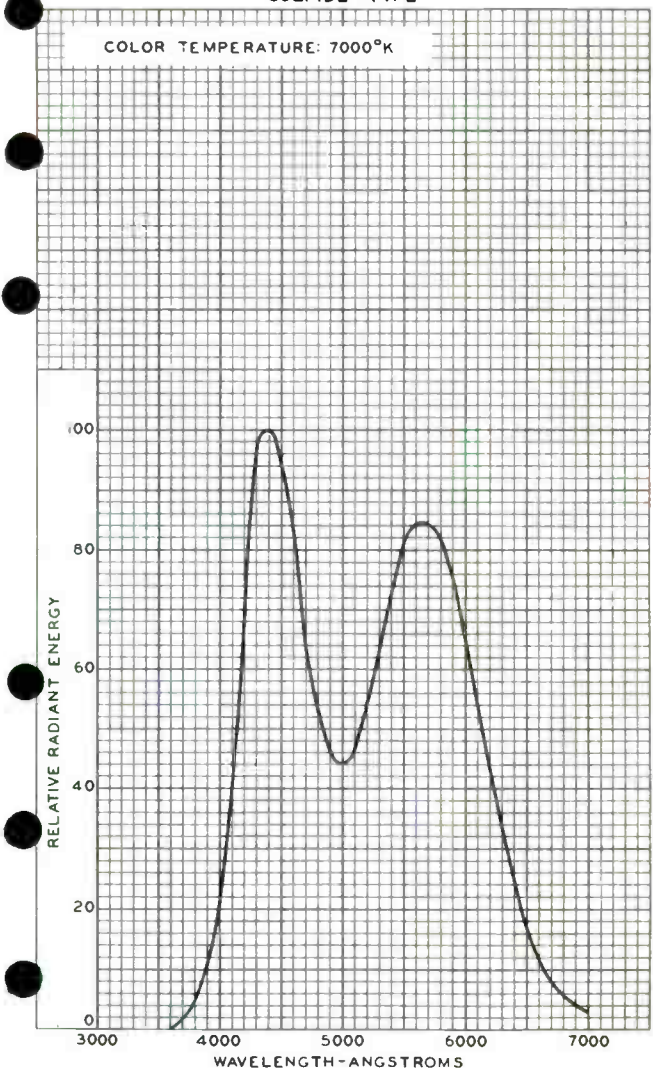


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7321

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P4

SULFIDE TYPE



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7316

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P4
SULFIDE TYPE

FOR KINESCOPES

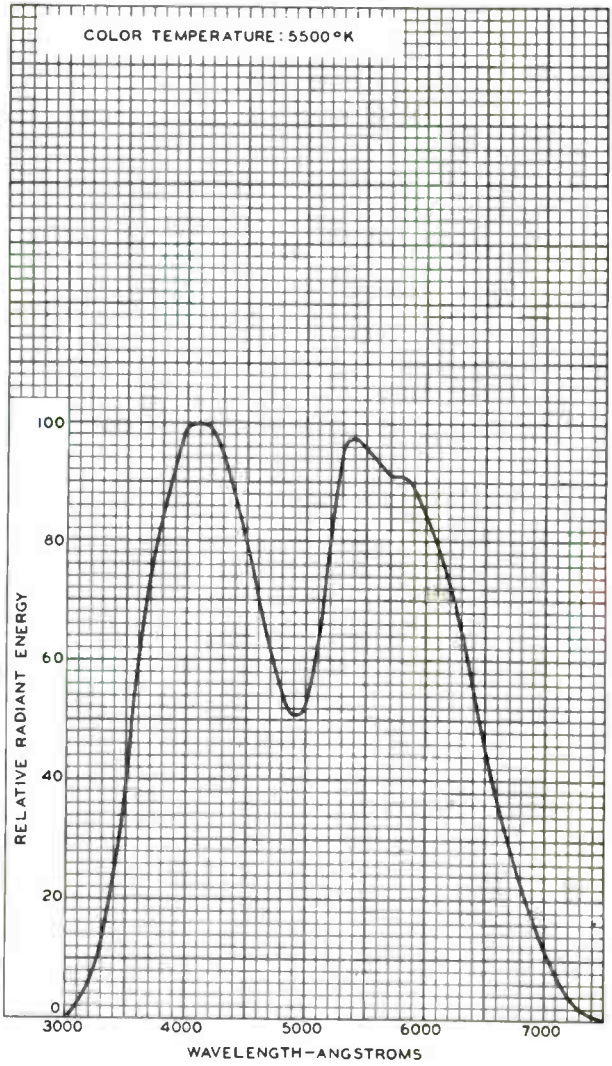
The persistence of the phosphorescence is such that its brightness does not exceed 7 per cent of the peak value in 33 milliseconds after excitation is removed.

FOR OSCILLOGRAPH TUBES

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

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P4

SILICATE TYPE



AUG. 2, 1949

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

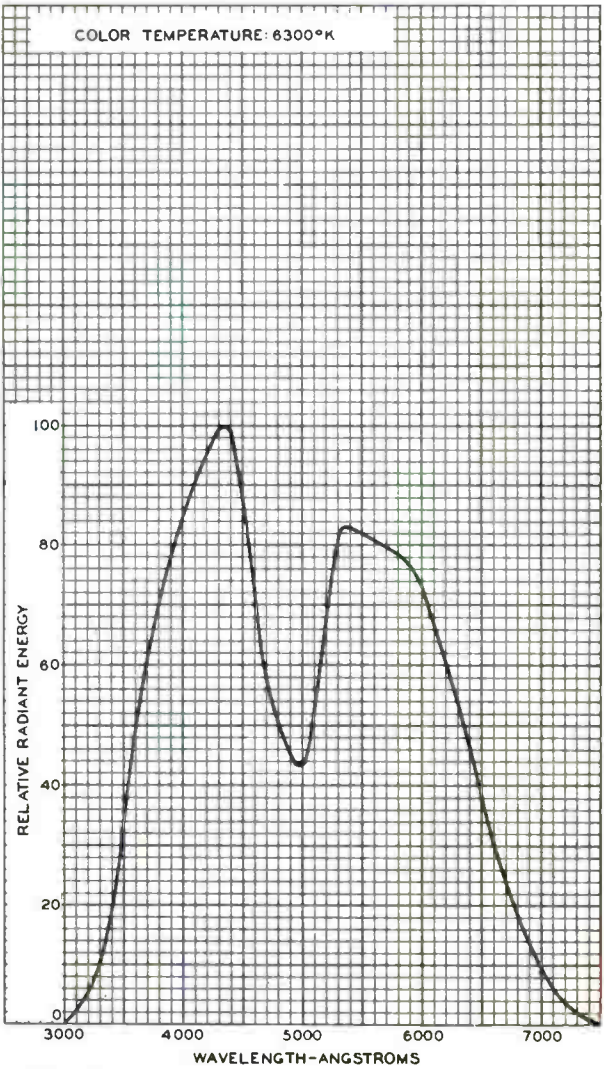
92CM-7335

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.

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR Nº4

SILICATE-SULFIDE TYPE



MARCH 6, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

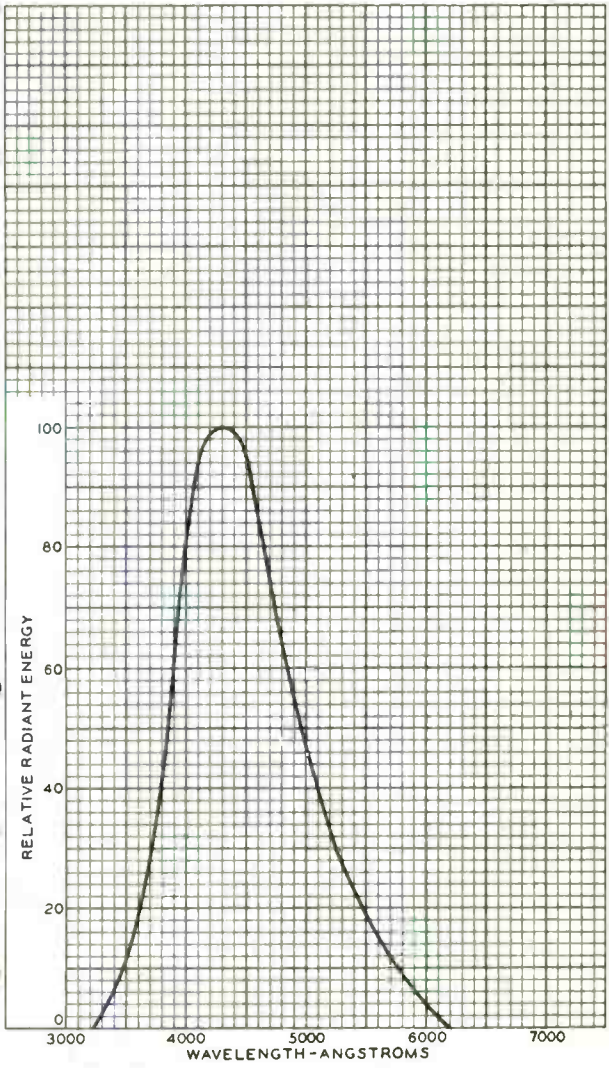
92CM-7458

PERSISTENCE CHARACTERISTIC OF PHOSPOR Nº 4

SILICATE-SULFIDE 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.

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR Nº 5

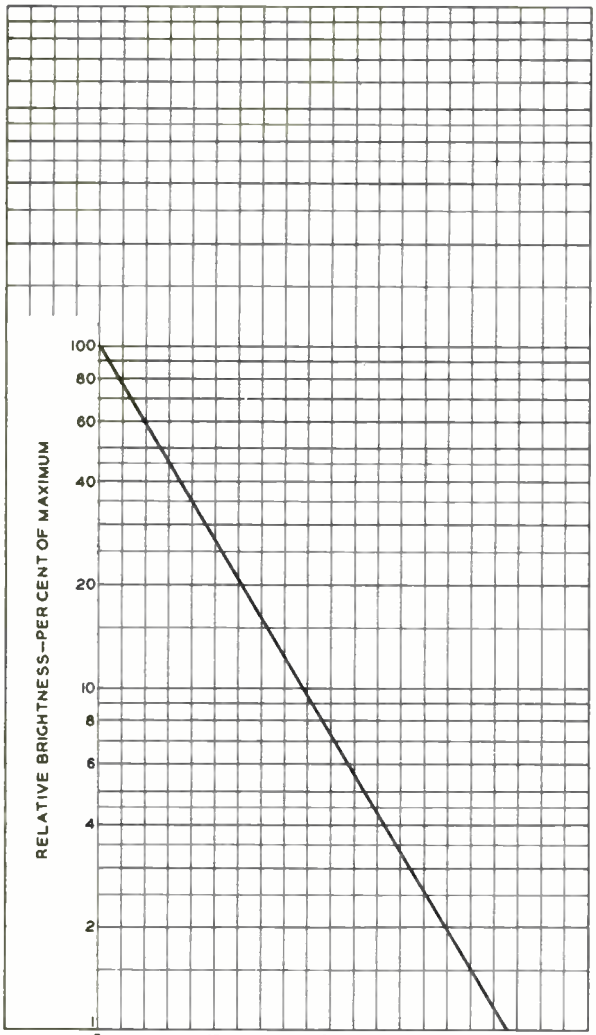


MAY 2, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-5559R2

PERSISTENCE CHARACTERISTIC OF PHOSPHOR Nº 5

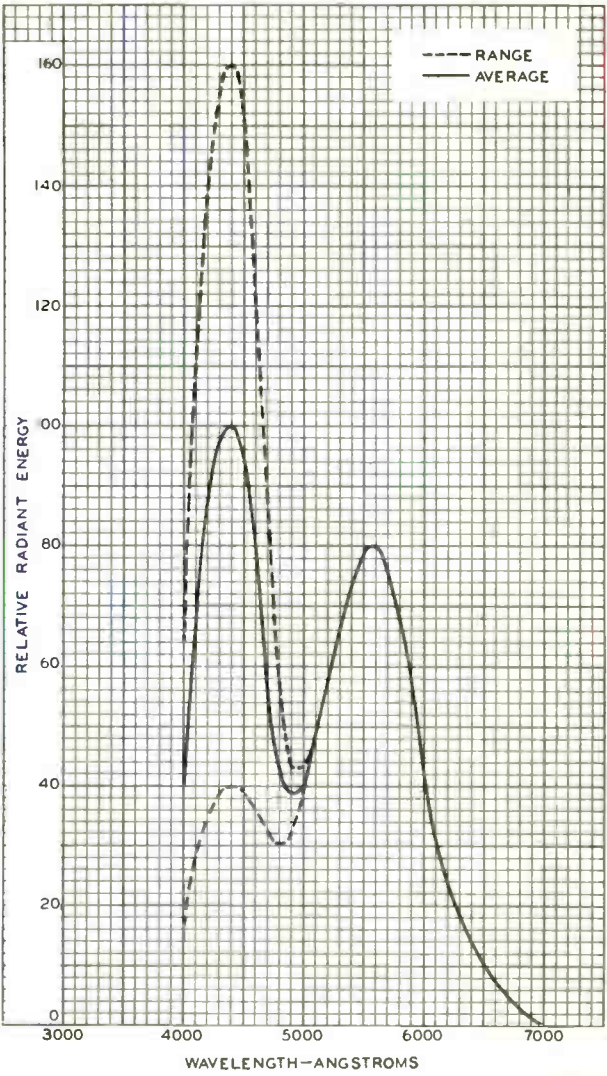


MAY 3, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7266

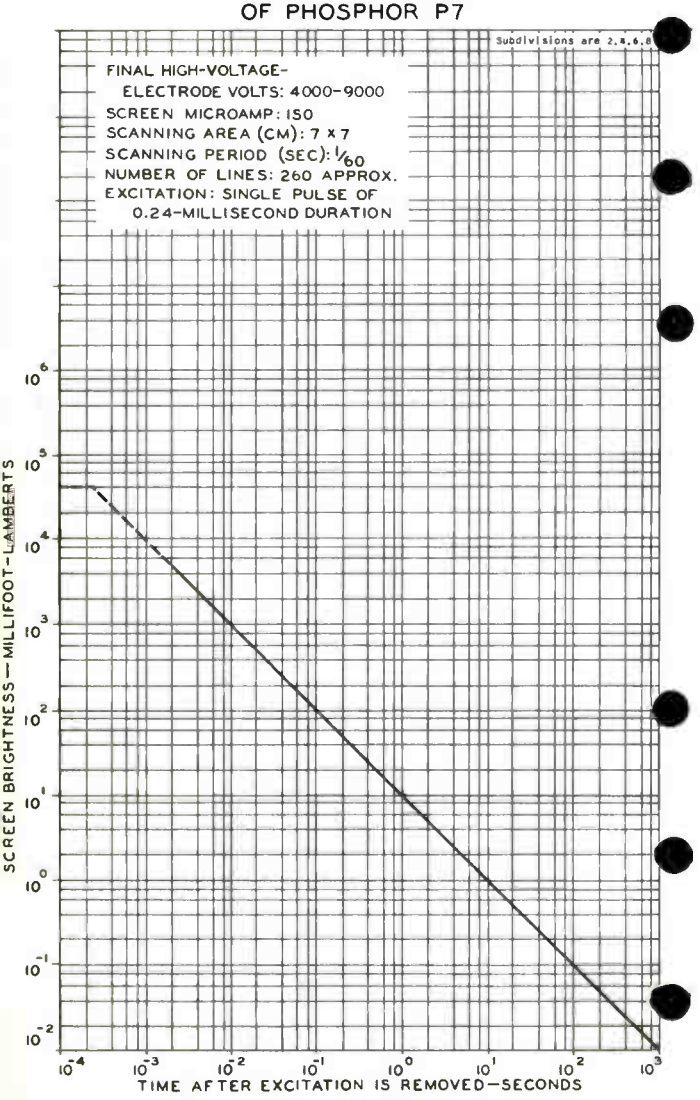
SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P7



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7336

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P7



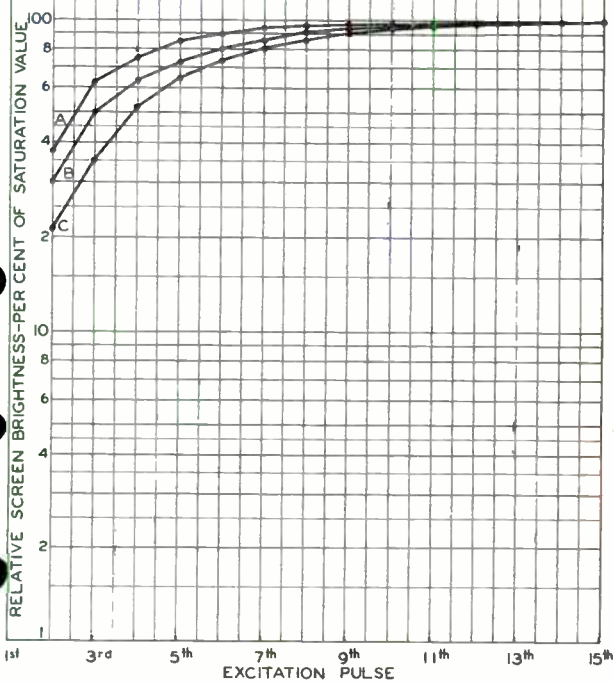
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7015R4

BUILDUP CHARACTERISTICS OF PHOSPHOR P7

FINAL HIGH-VOLTAGE-ELECTRODE VOLTS: 4000–9000
SCANNING AREA (CM): 7x7
NUMBER OF LINES: 260 APPROX.
EXCITATION: PULSE OF 1/60-SECOND DURATION SUPPLIED TO GRID No. 1 OF CATHODE-RAY TUBE AT 1-SECOND INTERVALS FOR EACH OF THE LOCI UNDER THE INDICATED CONDITIONS.
BRIGHTNESS: MEASURED JUST BEFORE EACH EXCITATION PULSE.

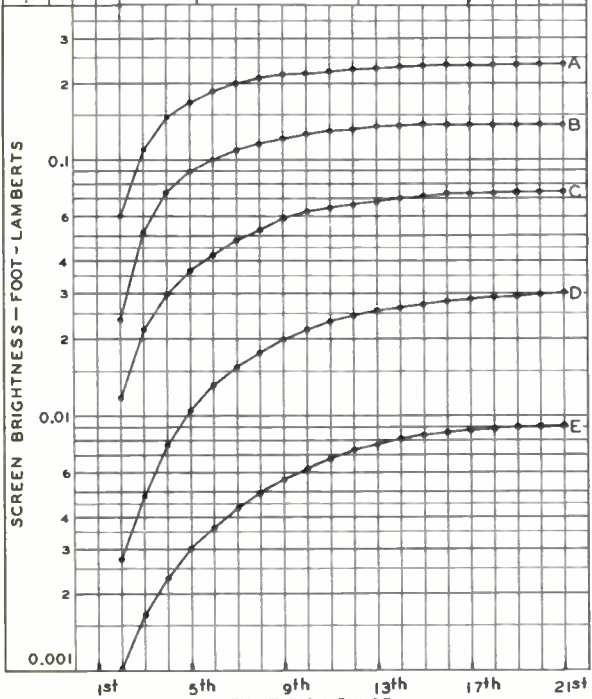
LOCUS	SCREEN MICROAMP
A	150
B	75
C	37



BUILDUP CHARACTERISTICS OF PHOSPHOR P7

SCANNING AREA (CM): 7 x 7
NUMBER OF LINES: 260 APPROX.
EXCITATION: PULSE OF 1/60-SECOND DURATION SUPPLIED TO GRID No.1 OF CATHODE-RAY TUBE AT 1-SECOND INTERVALS FOR EACH OF THE LOCI UNDER THE INDICATED CONDITIONS.
BRIGHTNESS: MEASURED JUST BEFORE EACH EXCITATION PULSE.

LOCUS	FINAL HIGH-VOLTAGE-ELECTRODE VOLTS	SCREEN MICROAMP
A	4000	150
B	4000	75
C	2500	75
D	2500	37
E	1500	37

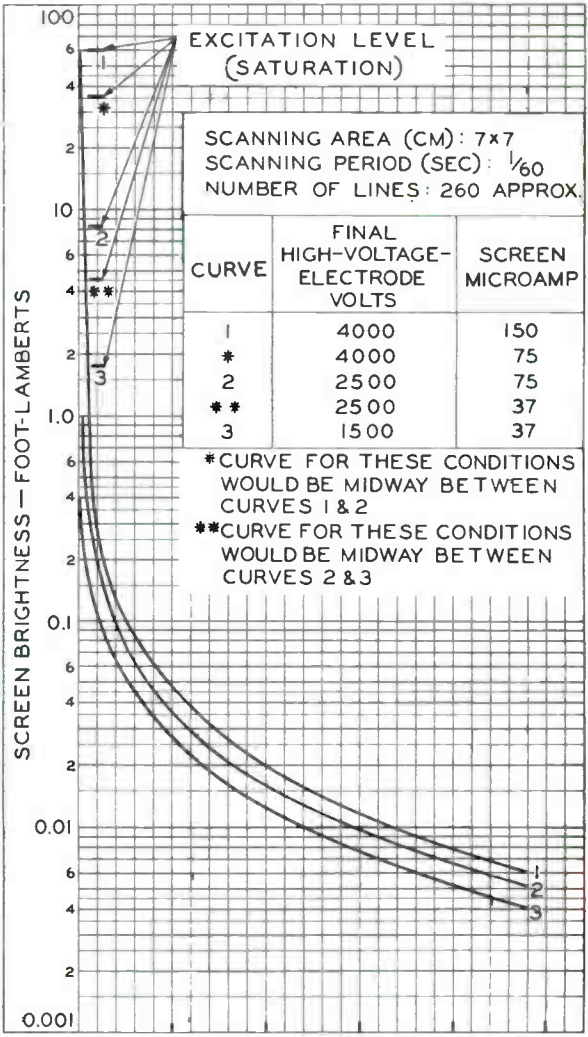


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6805R5

RCA

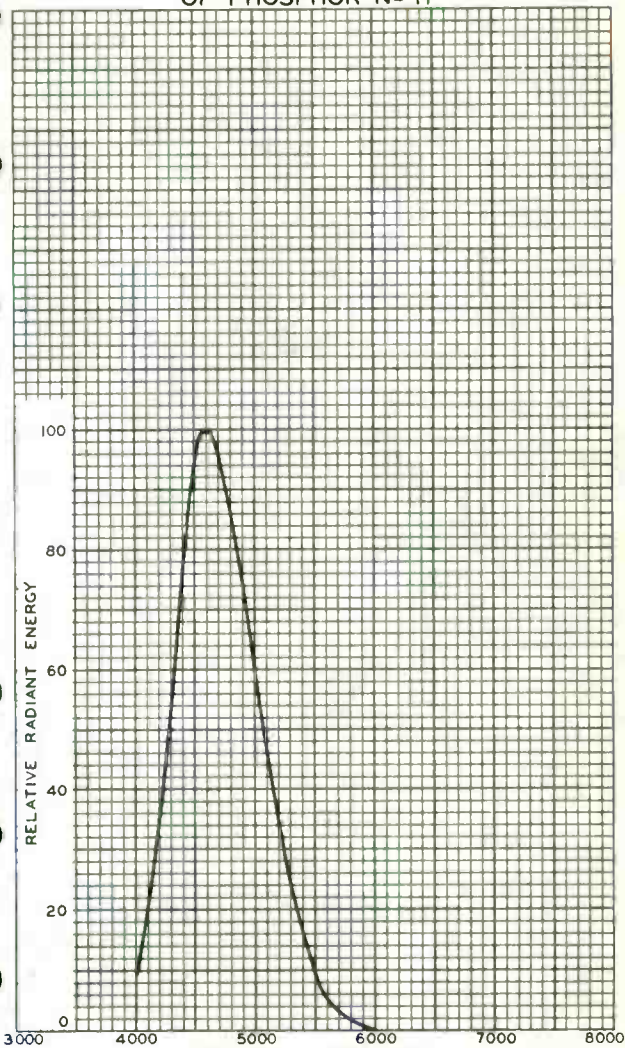
PERSISTENCE CHARACTERISTICS OF PHOSPHOR P7



TUBE DIVISION 92CL-6804R5

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR Nº 11

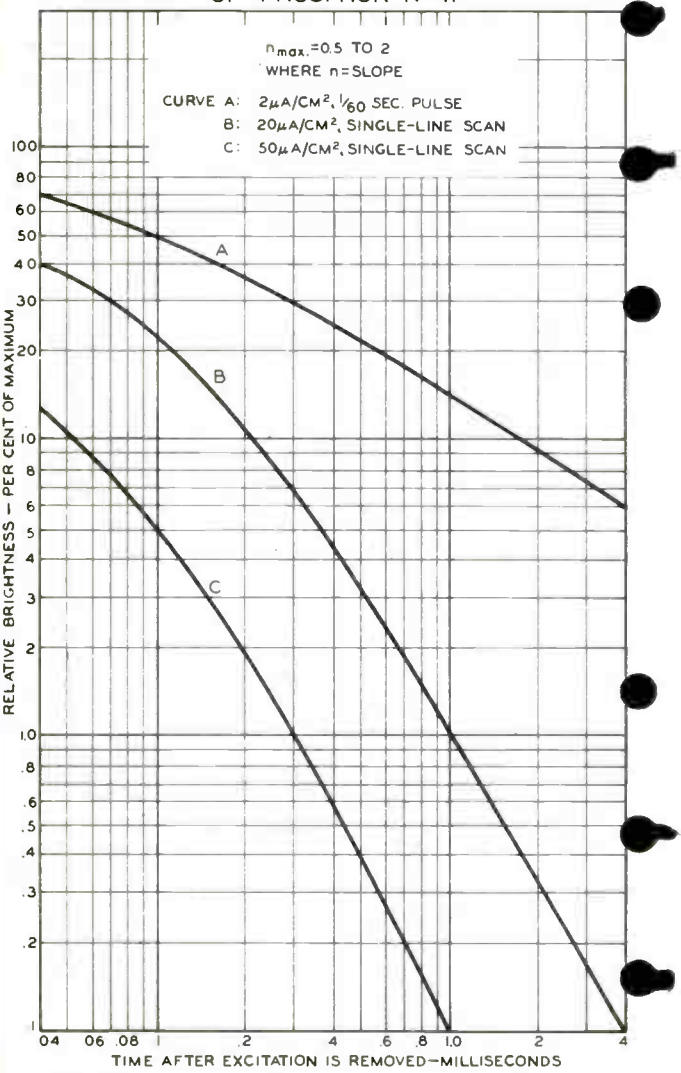


APRIL 9, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6749

PERSISTENCE CHARACTERISTICS OF PHOSPHOR N°11

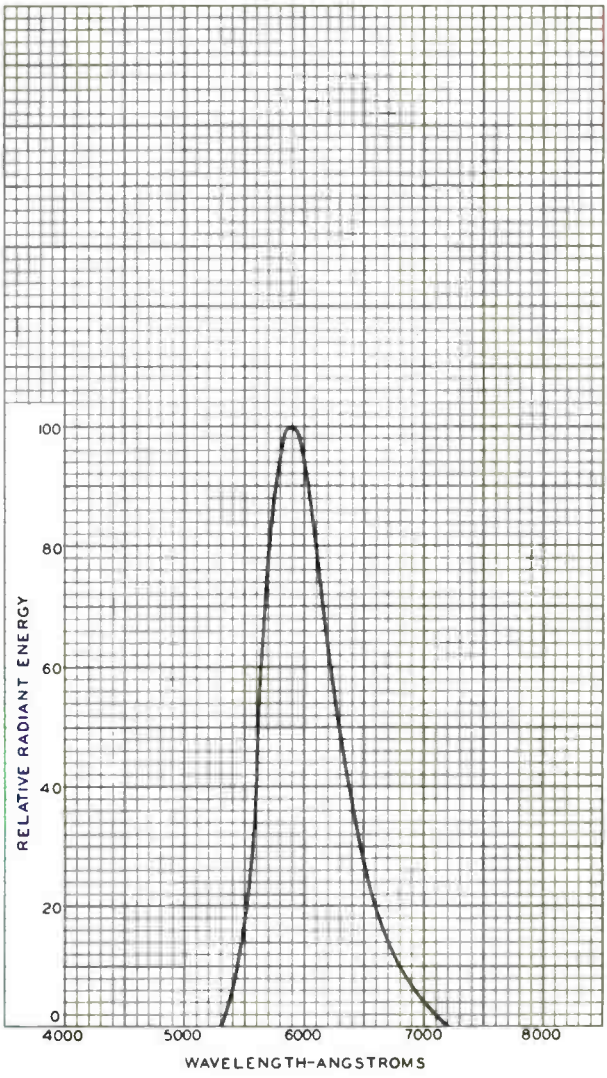


JULY 7, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6806R2

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P12

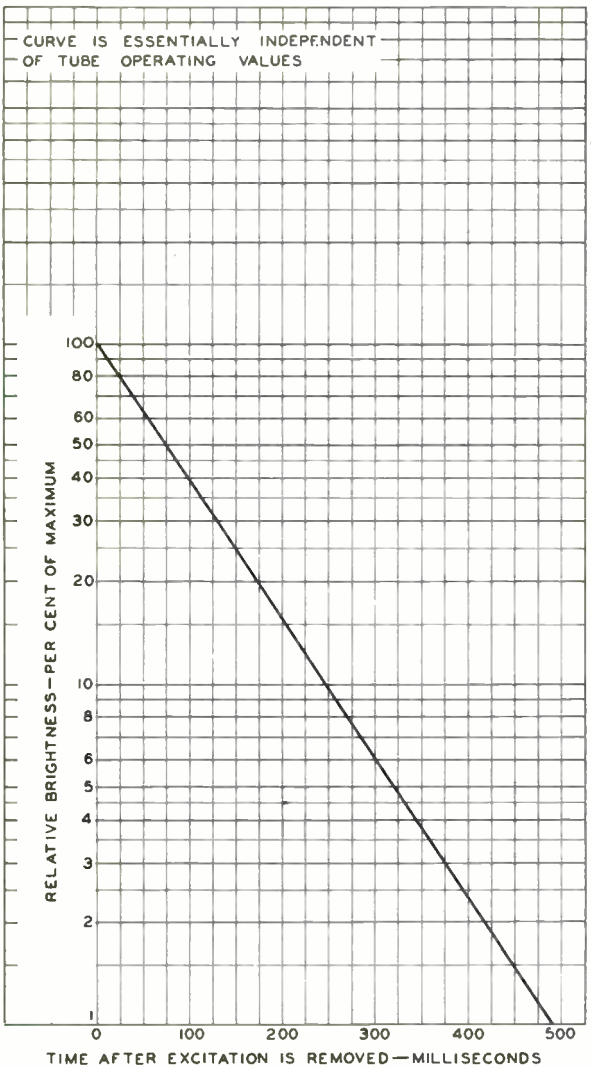


JULY 18, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

92CM-7317

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P12



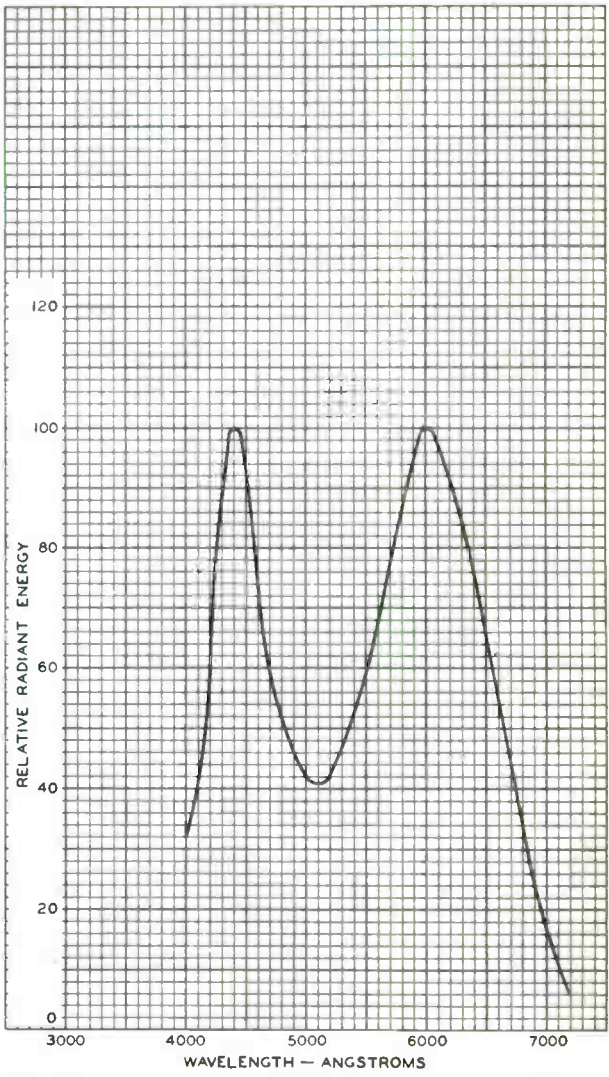
FEB. 1, 1951

TUBE DEPARTMENT

RADIO CORPORATION of AMERICA HARRISON, NEW JERSEY

92CM-7318RI

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P14

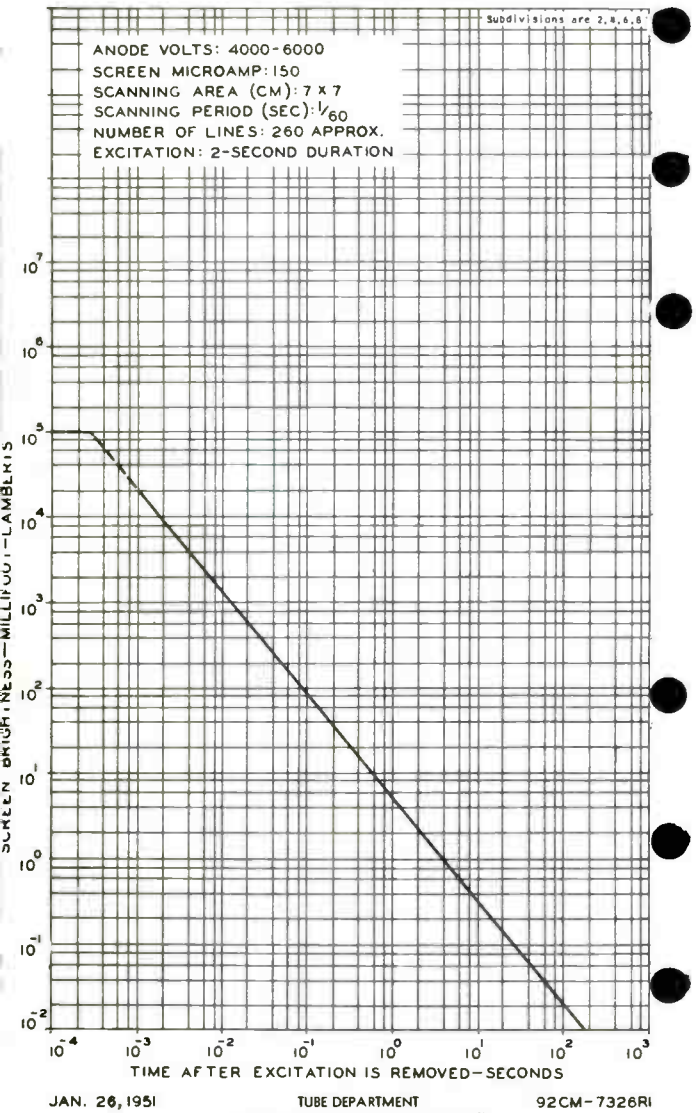


AUG. 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7675

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P14



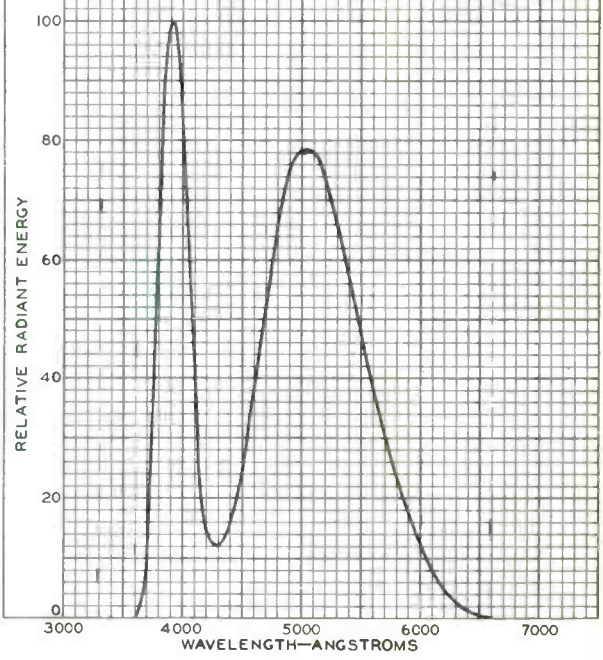
JAN. 26, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7326RI

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P15

COMPONENT	COLOR	I.C.I. COORDINATES	
		X	Y
VISIBLE	GREEN	0.246	0.439
ULTRAVIOLET	——	——	——



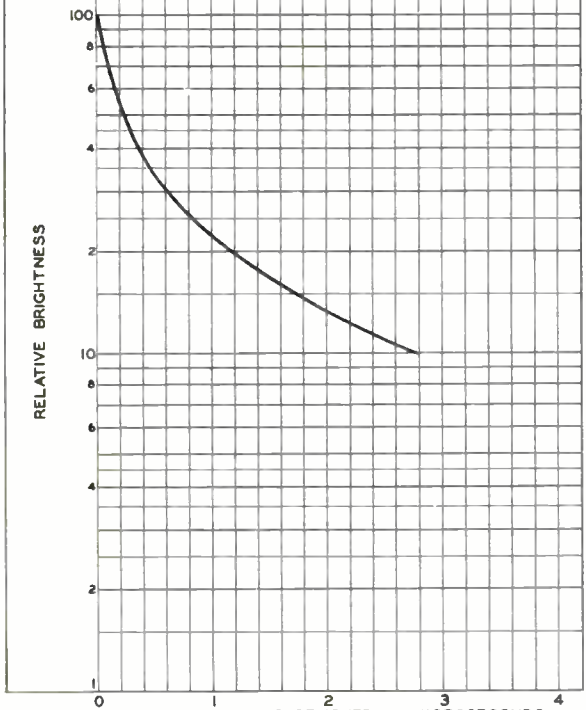
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6915R1

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P15

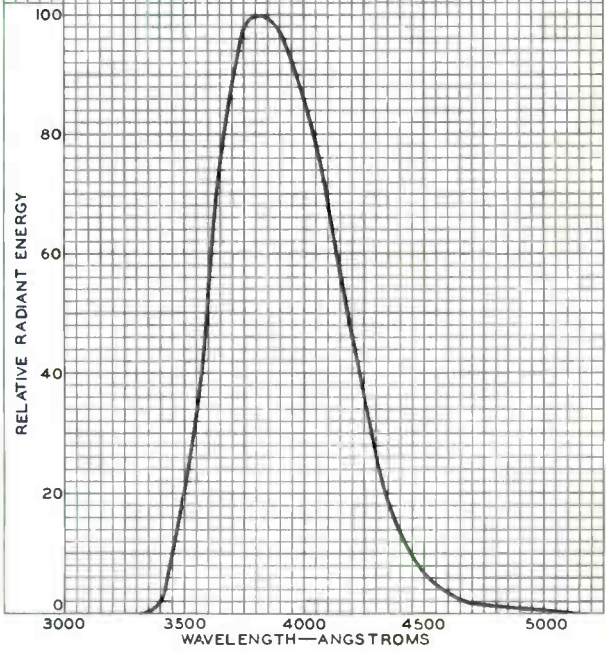
COMPONENTS	EACH ESSENTIALLY INDEPENDENT OF TUBE OPERATING VALUES.
VISIBLE ULTRAVIOLET	SHOWN BY CURVE. DECAYS TO APPROXIMATELY 10 % OF MAXIMUM IN NOT MORE THAN 0.05 MICROSECOND.

SPOT: SHARPLY FOCUSED.

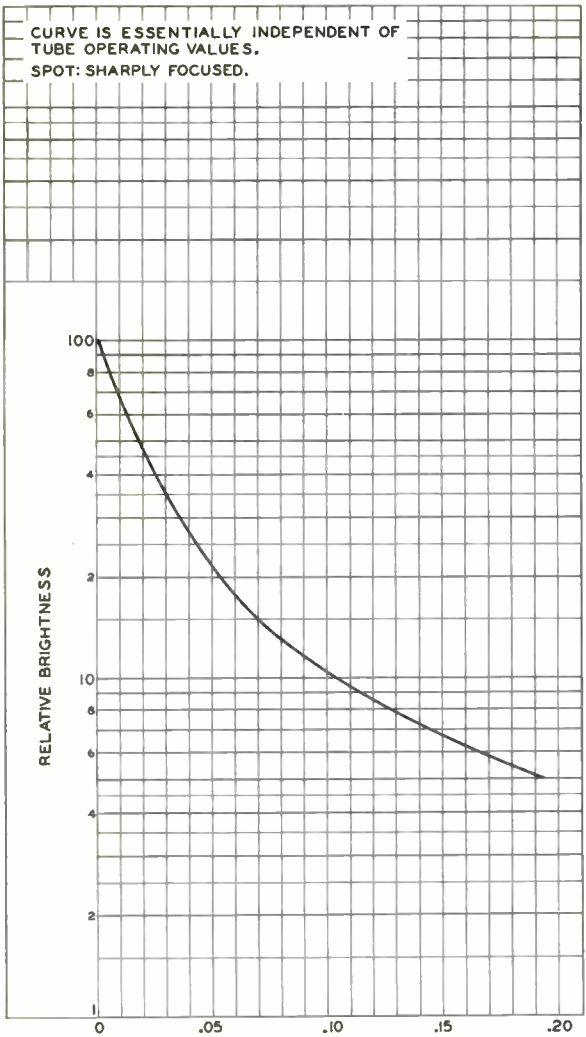


SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P16

COMPONENT	COLOR	I.C.I. COORDINATES	
		X	Y
VISIBLE	VIOLET	0.175	0.003
NEAR ULTRAVIOLET	—	—	—



PERSISTENCE CHARACTERISTIC OF PHOSPHOR P16

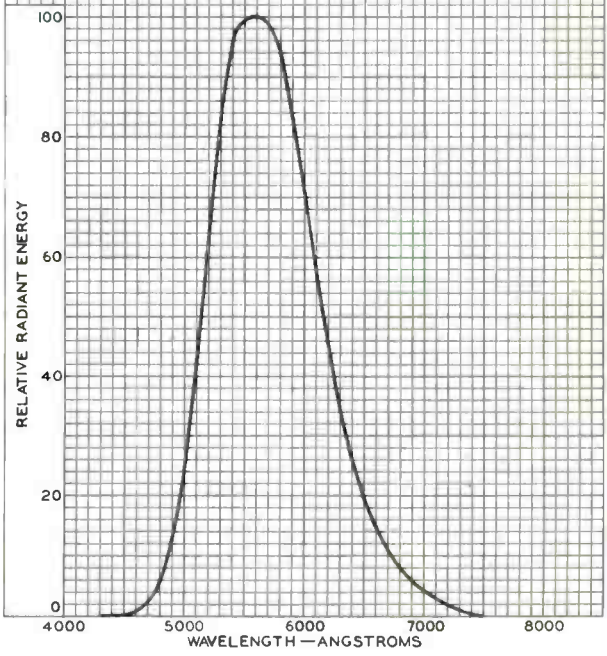


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7564RI

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P20

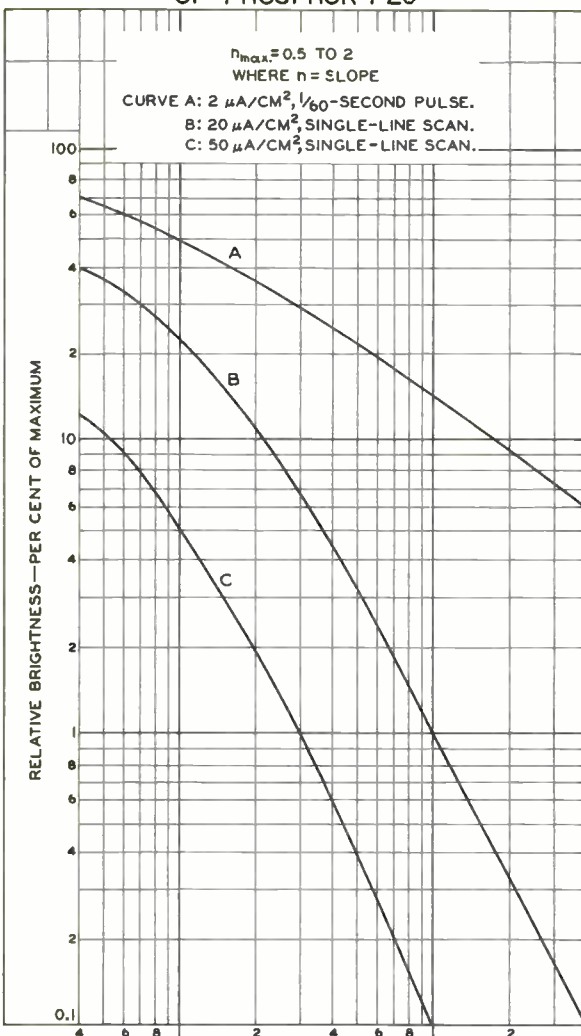
COLOR	I.C.I. COORDINATES	
	X	Y
YELLOW-GREEN	0.422	0.558



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

92CM-7647RI

PERSISTENCE CHARACTERISTICS OF PHOSPHOR P20



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

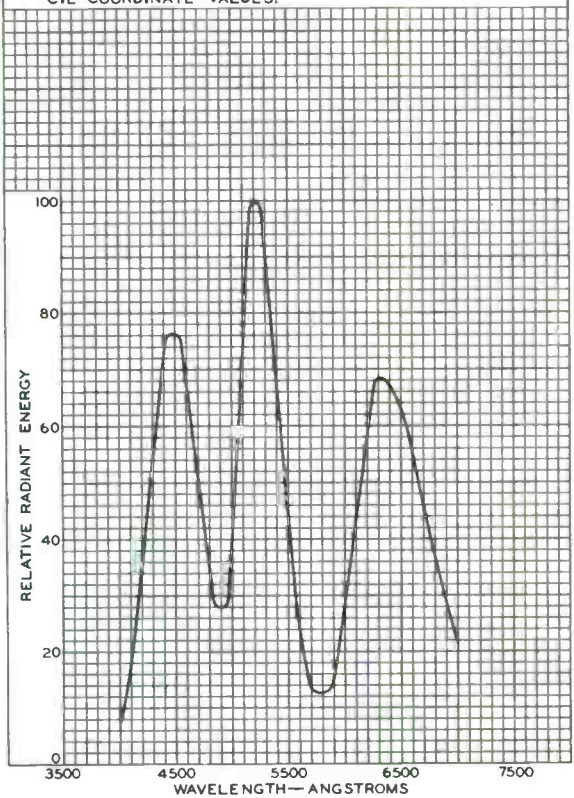
92CM-6806R2

SPECTRAL-ENERGY EMISSION CHARACTERISTIC

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

COMPONENT COLOR		CIE COORDINATES	
GENERAL DESCRIPTION	JEDEC DESIGNATION*	X	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

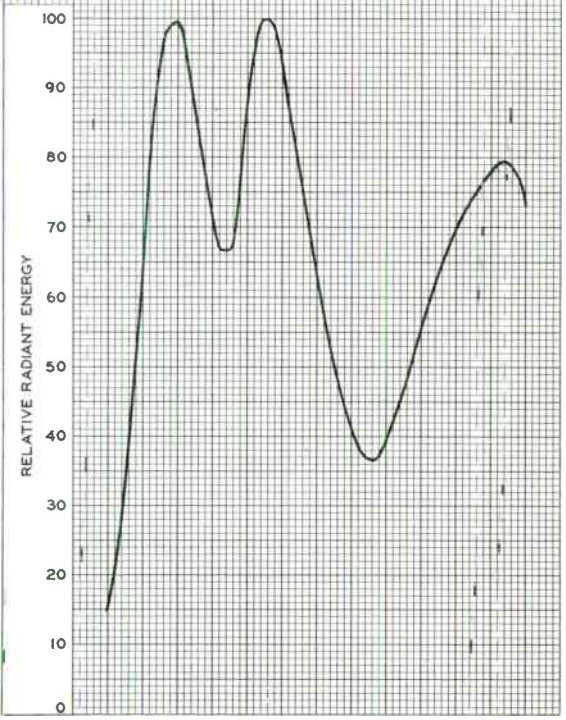
PERSISTENCE CHARACTERISTIC

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

SIMULTANEOUS EXCITATION OF BLUE PHOSPHOR, GREEN PHOSPHOR, AND RED PHOSPHOR TO PRODUCE 9300° K +27 M.P.C.D. WHITE(X=0.281, Y=0.311).

COMPONENT COLOR	C.I.E. COORDINATES	
	X	Y
BLUE	0.155	0.061
GREEN	0.265	0.585
RED	0.639	0.342



92CM-10857

Group Phosphor P22

All-Sulfide 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
60 microseconds (Approx.). . . . . Red phosphor

RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.

Group Phosphor P22

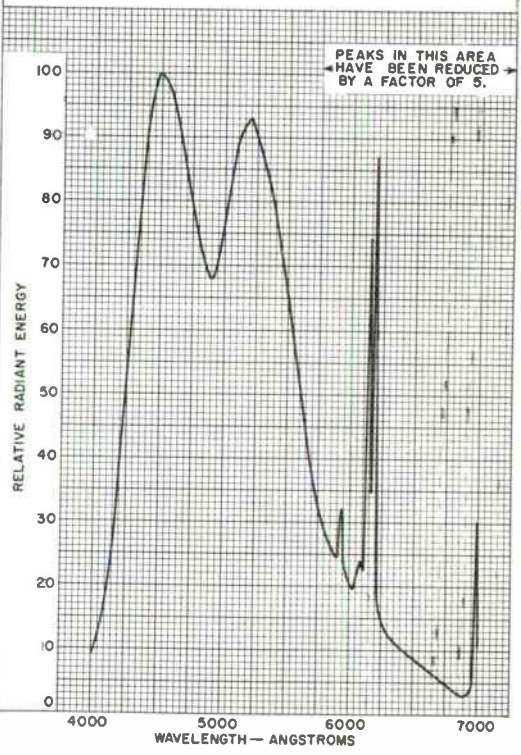
Rare-Earth (Red), Sulfide (Blue & Green) Type[a]

Spectral-Energy Emission Characteristic

[a] 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 = 0.281, Y = 0.311).

COMPONENT COLOR	C.I.E. COORDINATES	
	X	Y
RED	0.676	0.324
BLUE	0.155	0.061
GREEN	0.290	0.590



92CM-13088RI

Group Phosphor P22

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

PERSISTENCE CHARACTERISTIC

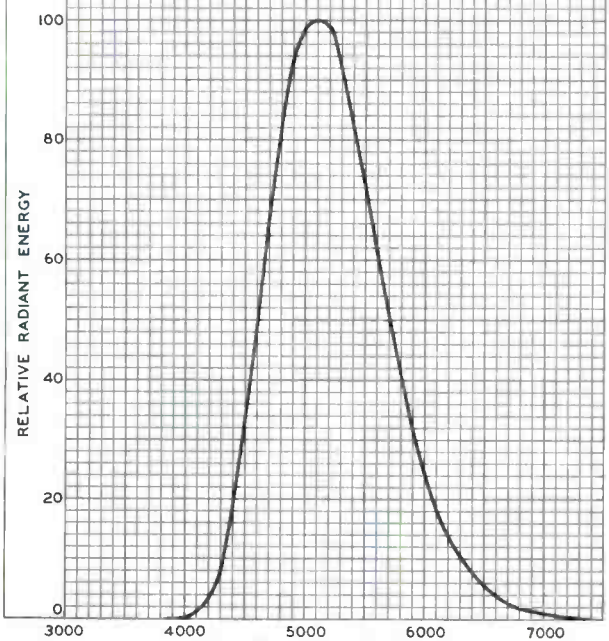
The persistence of the group phosphorescence is *medium short*. Persistence of the component phosphors is such that after excitation is removed, brightness decays to a level not exceeding 10 per cent of the initial value in:

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

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P24

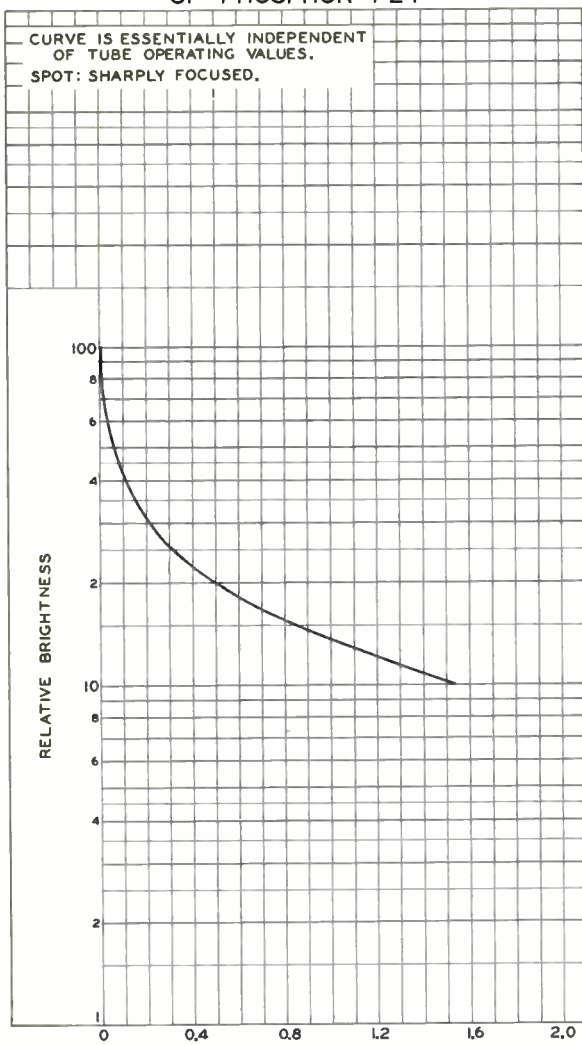
COLOR	I.C.I. COORDINATES	
	X	Y
GREEN	0.245	0.441



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

92CM-8204RI

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P24



ELECTRON TUBE DIVISION 92CM-8205R2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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. Tube neck length, 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 picture-tube data sheets 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

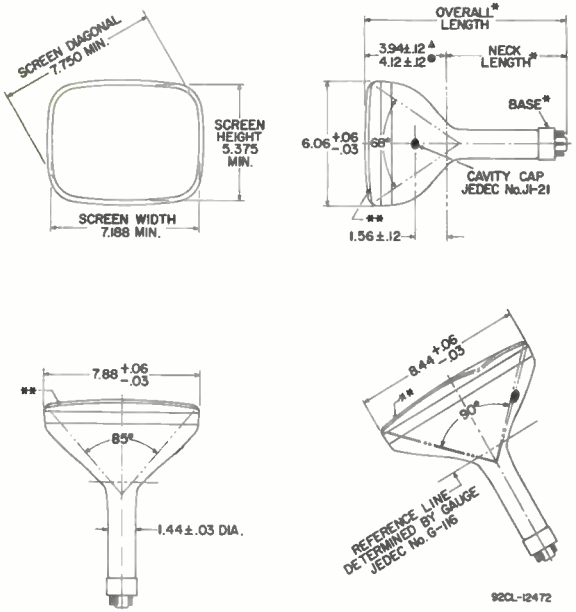
Near Reference Line. Refers to the position of the contact area usually employed for grounding a Regular or Modified Band of external conductive coating. A spring-finger contact mounted on the deflecting yoke or on the tube mounting assembly is normally employed for grounding the external conductive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



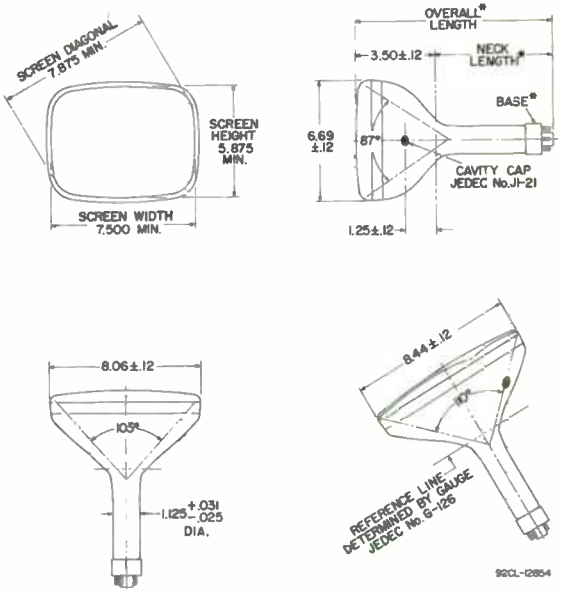
DIMENSIONS IN INCHES

* See data for specific tube type.
** Integral protective window is indicated.
▲ For bulb without protective window.
● For bulb with protective window.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Dimensional Outline Bulb J67-1/2 B

FOR PICTURE TUBES UTILIZING BULB J67-1/2 B

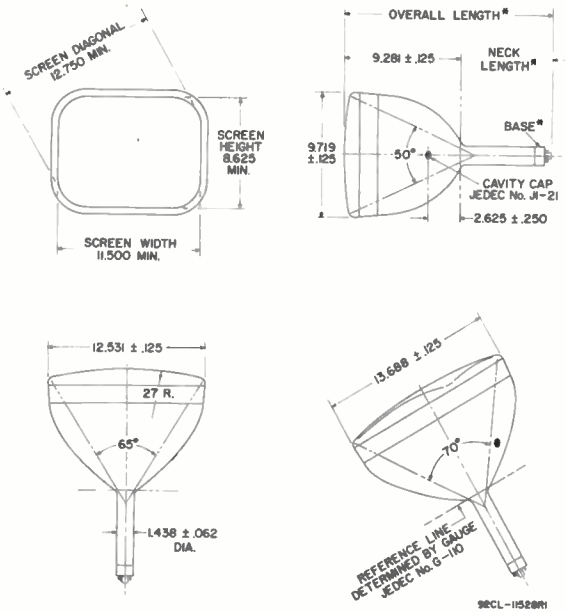


DIMENSIONS IN INCHES

* See data for specific tube type.

Dimensional Outline Bulb J109-1/2 A/C

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



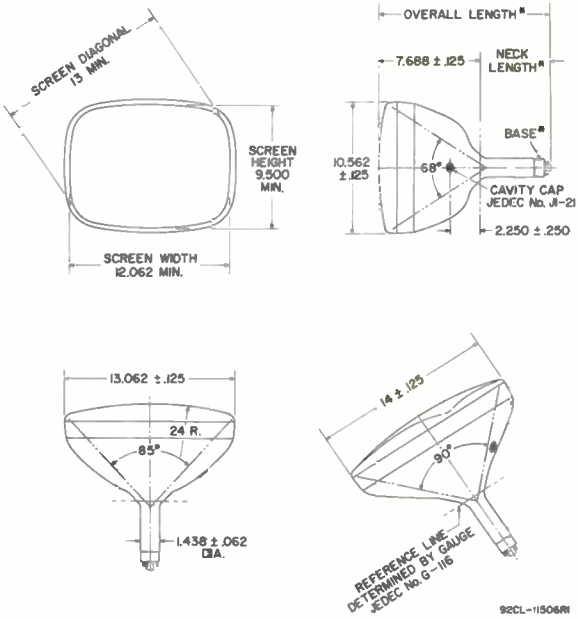
DIMENSIONS IN INCHES

* See data for specific tube type.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

Dimensional Outline Bulb J112 A/B

FOR PICTURE TUBES UTILIZING BULB J112 A/B

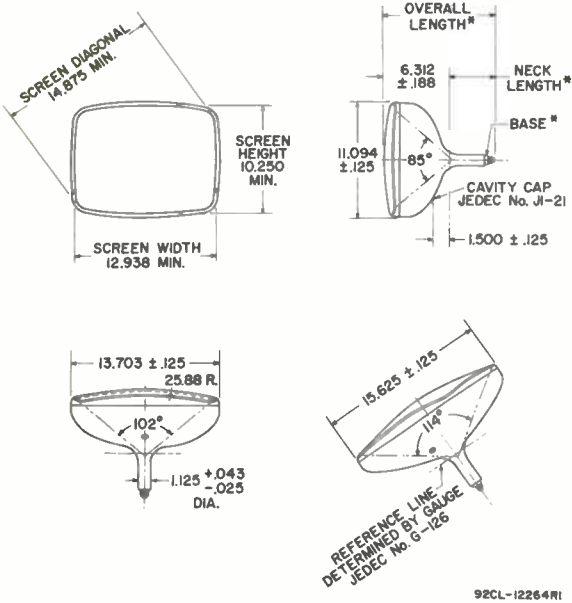


DIMENSIONS IN INCHES

* See data for specific tube type.

Dimensional Outline Bulb J125 A

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



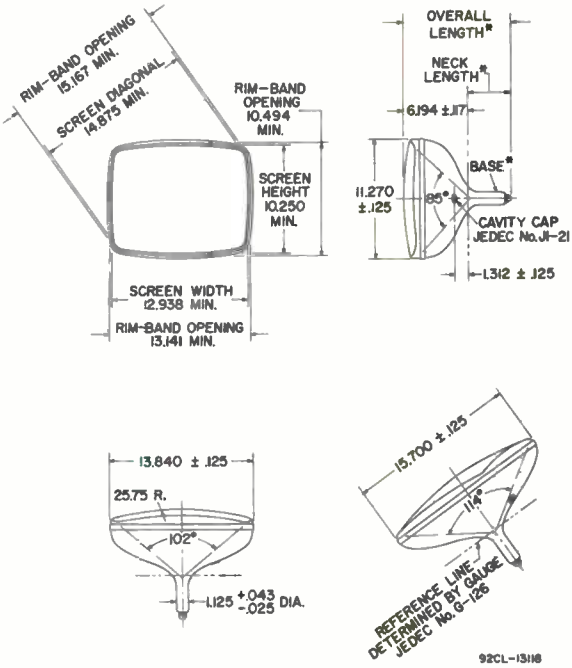
DIMENSIONS IN INCHES

* See data for specific tube type.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Dimensional Outline — Bulb J125 B

FOR PICTURE TUBE UTILIZING BULB J125 B

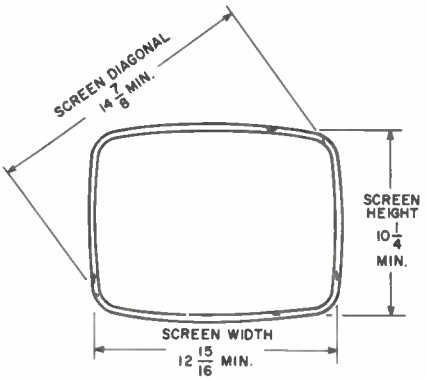


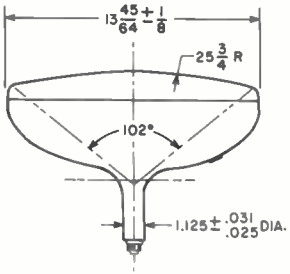
DIMENSIONS IN INCHES

* See data for specific tube type.

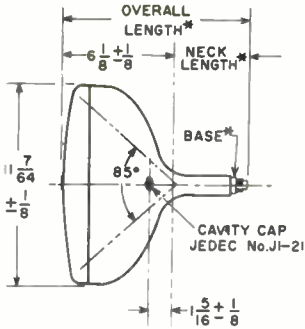
Dimensional Outline

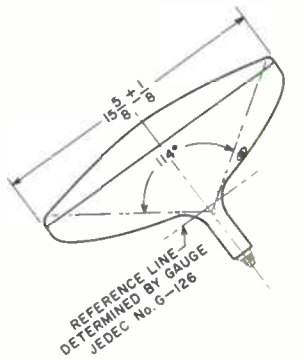
FOR PICTURE TUBES UTILIZING BULB J125 C2





BULB J125 C2





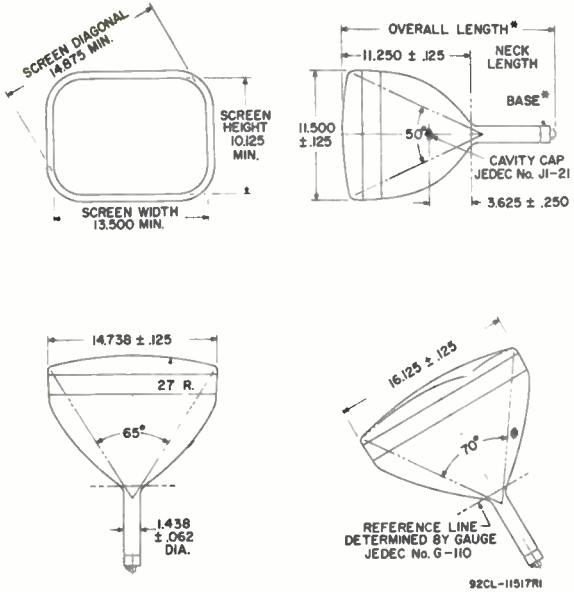
92CL-12037

DIMENSIONS IN INCHES

* See data for specific tube type.

Dimensional Outline Bulb J129 A/B

FOR PICTURE TUBES UTILIZING BULB J129 A/B



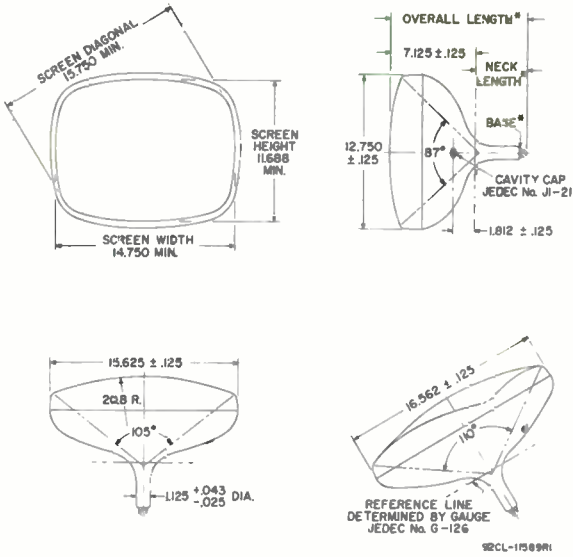
DIMENSIONS IN INCHES

* See data for specific tube type.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Dimensional Outline Bulb J132-1/2 A/B

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

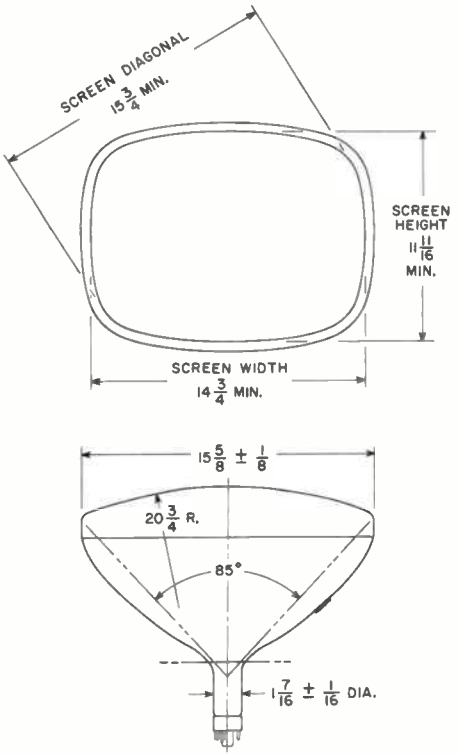


DIMENSIONS IN INCHES

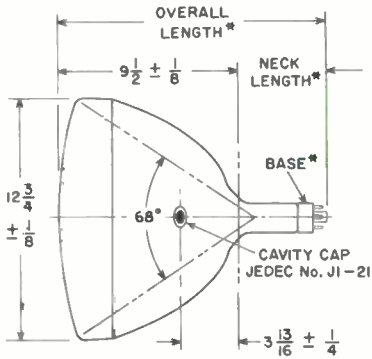
* See data for specific tube type.

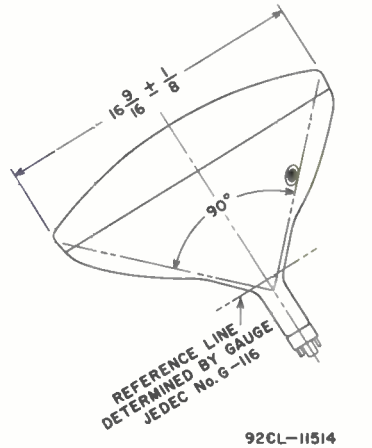
Dimensional Outline

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



BULB J132-1/2 C/D



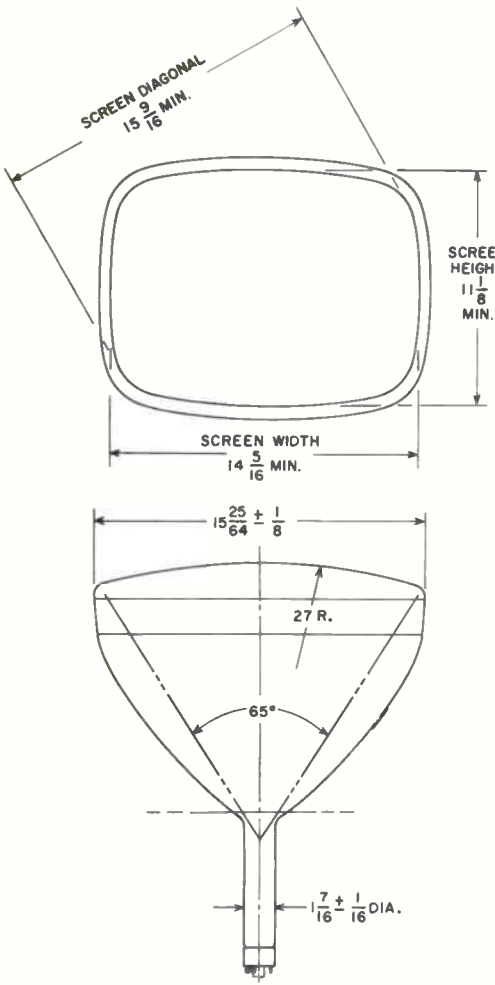


ALL DIMENSIONS IN INCHES

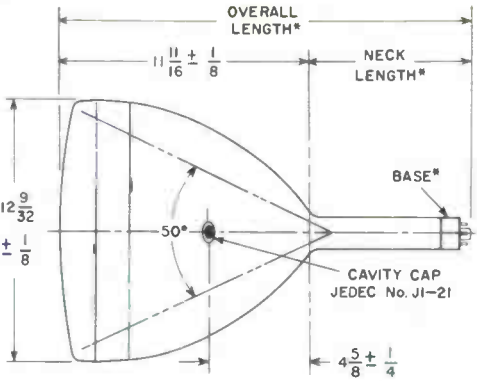
* See data for specific tube type.

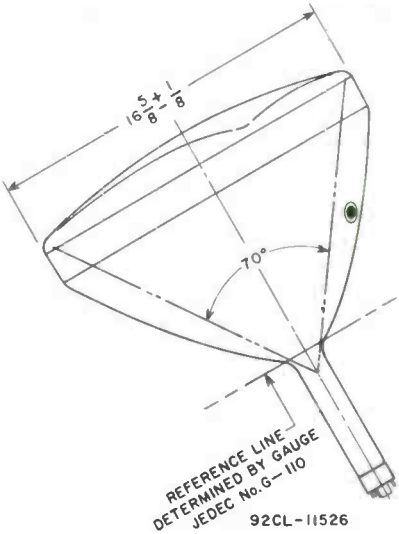
Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J133 B/D





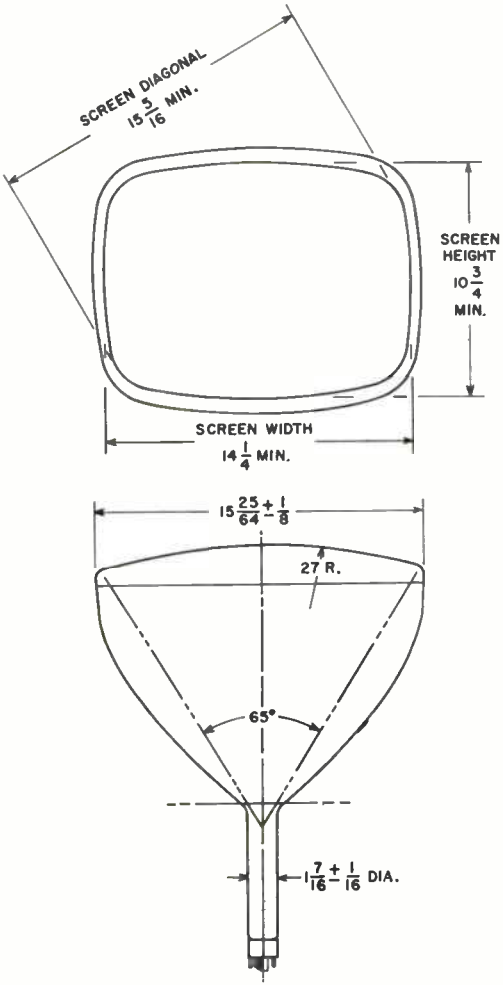
92CL-11526

ALL DIMENSIONS IN INCHES

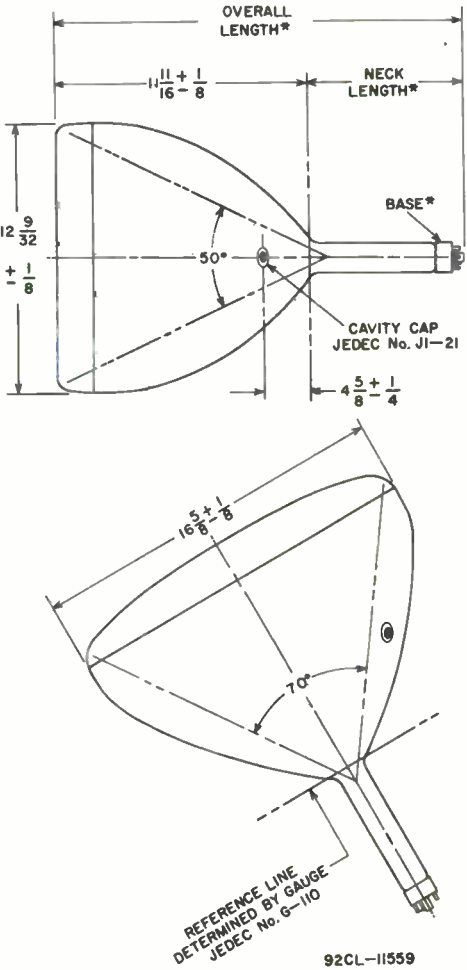
* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J133 C/E

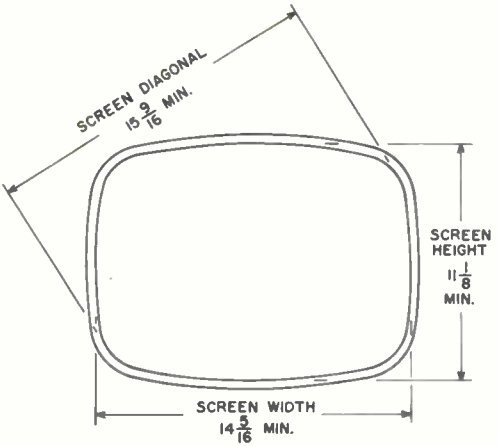


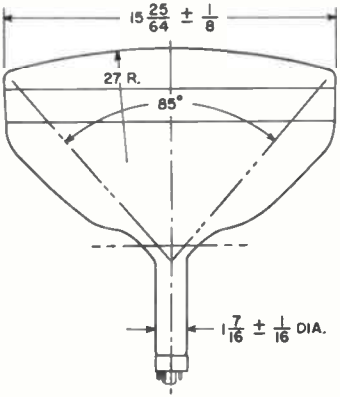
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

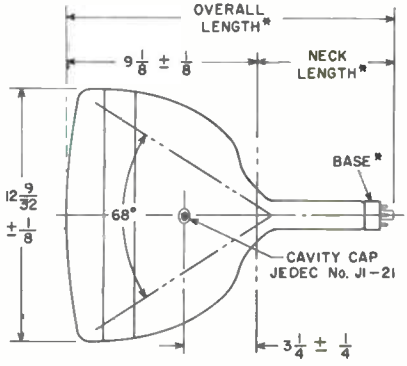
Dimensional Outline

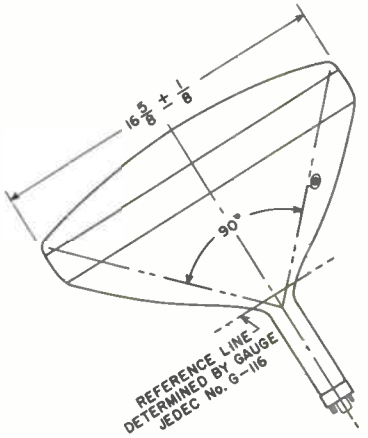
FOR PICTURE TUBES UTILIZING





BULB J133 F/G





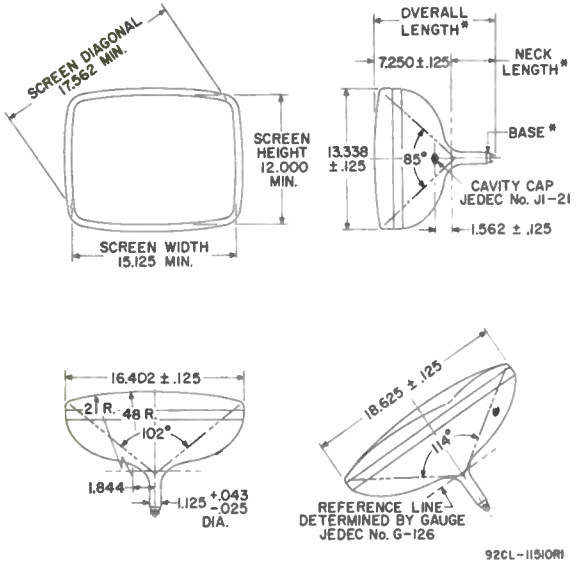
92CL-11557

DIMENSIONS IN INCHES

* See data for specific tube type.

Dimensional Outline — Bulb J149 A

FOR PICTURE TUBES UTILIZING BULB J149 A



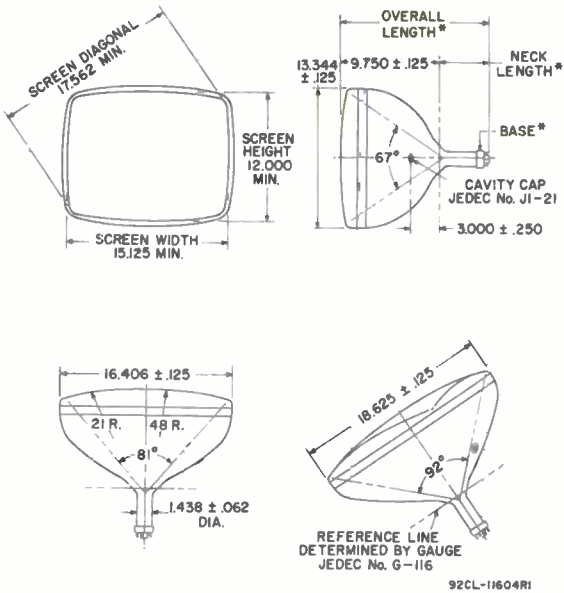
DIMENSIONS IN INCHES

* See data for specific tube type.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

Dimensional Outline — Bulb J149 B

FOR PICTURE TUBES UTILIZING BULB J149 B

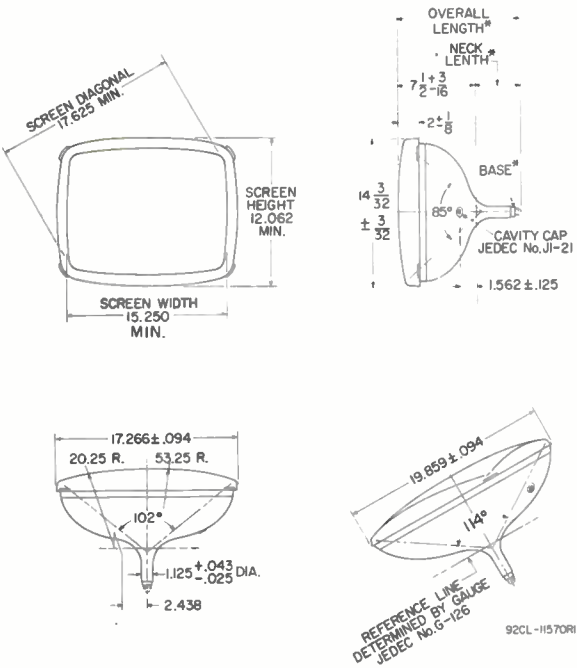


DIMENSIONS IN INCHES

* See data for specific tube type.

Dimensional Outline — Bulb J149 C

FOR PICTURE TUBES UTILIZING BULB J149 C AND PROTECTIVE PANEL



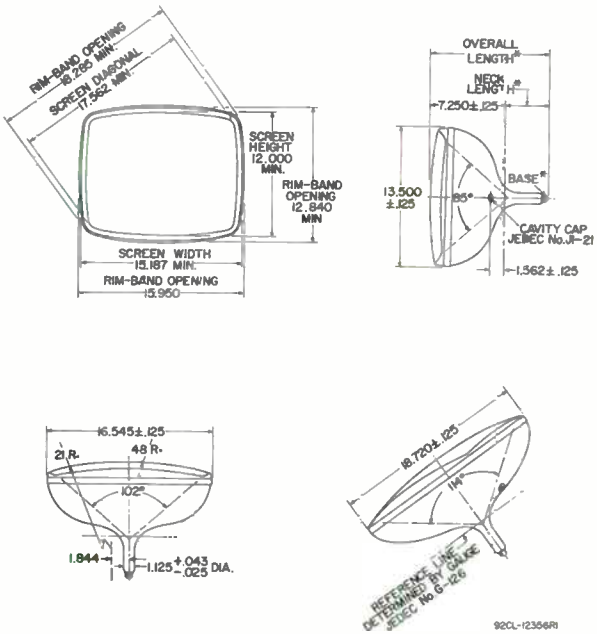
DIMENSIONS IN INCHES

* See data for specific tube type.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

Dimensional Outline — Bulb J149 F

FOR PICTURE TUBES UTILIZING BULB J149 F

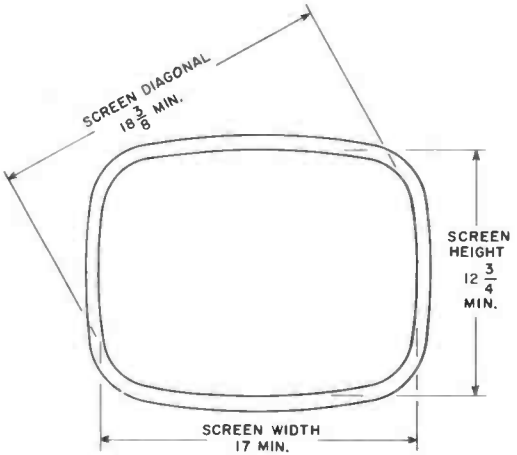


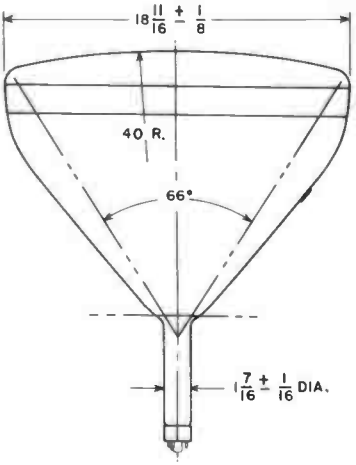
DIMENSIONS IN INCHES

*See data for specific tube type.

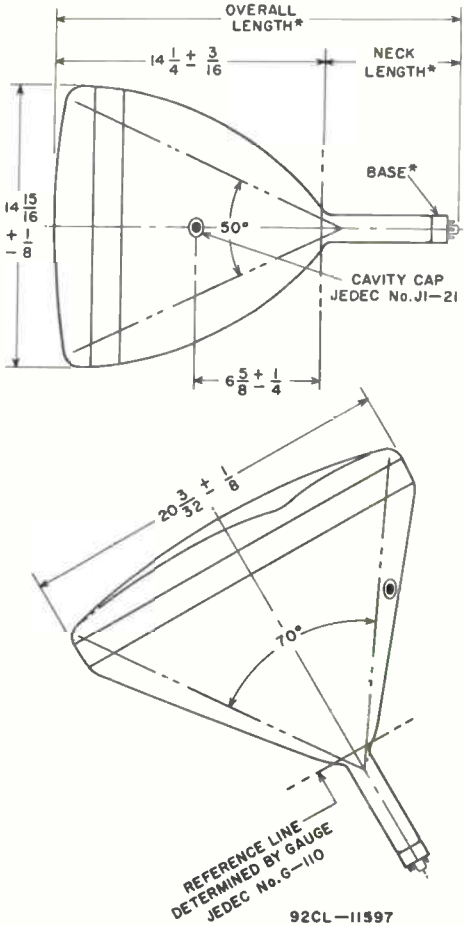
Dimensional Outline

FOR PICTURE TUBES UTILIZING BULB J161 C/D





BULB J161 C/D

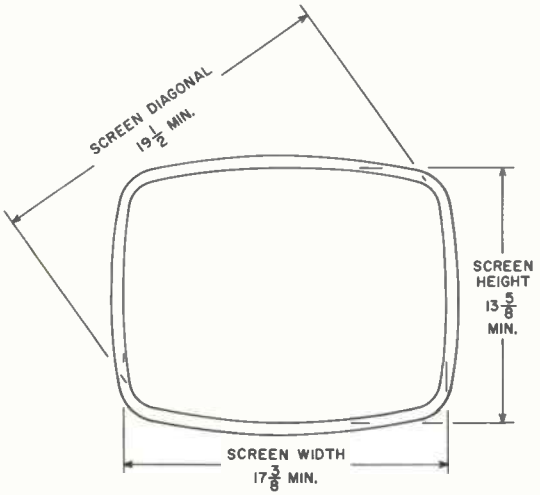


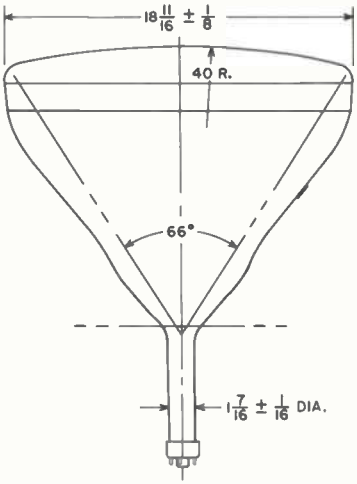
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

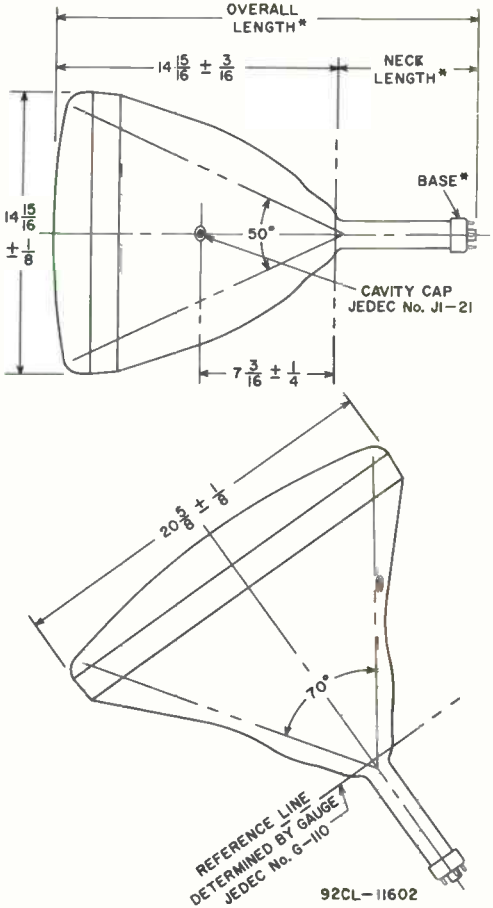
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J165 Z

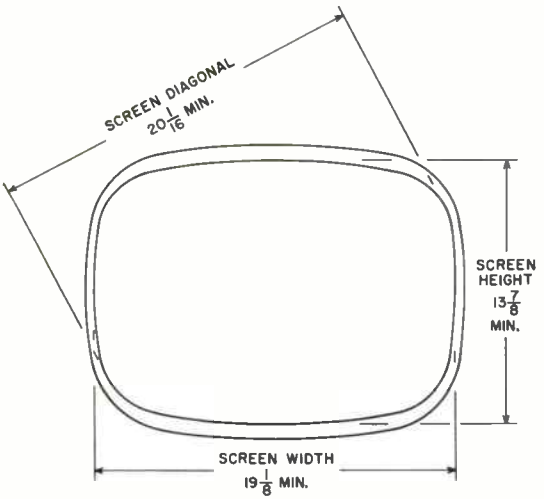


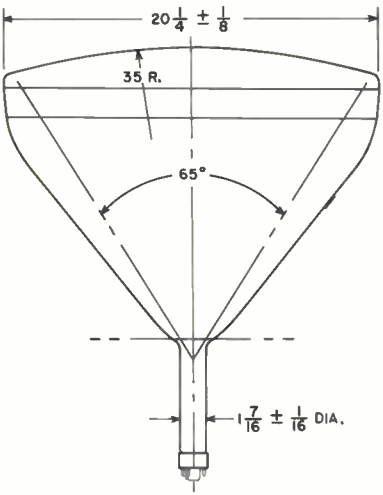
ALL DIMENSIONS IN INCHES

*See data for specific tube type.

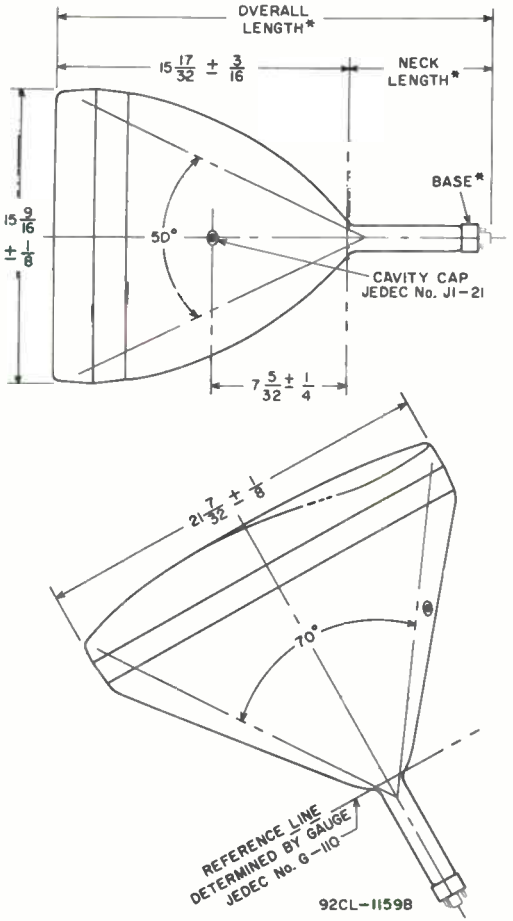
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J170 A/C

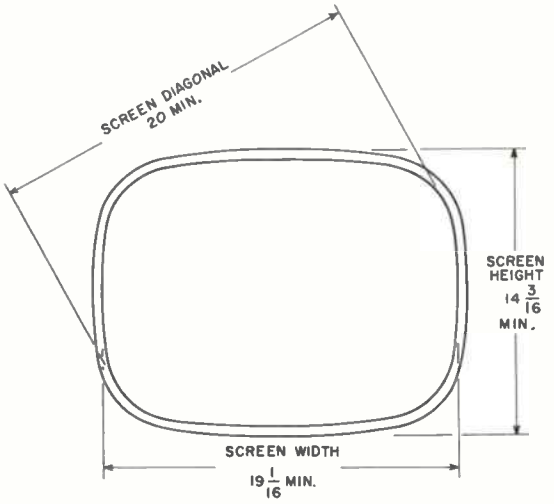


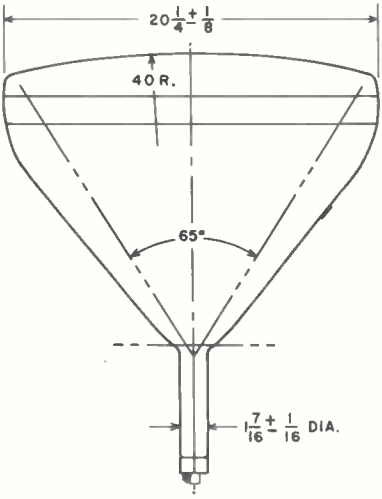
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

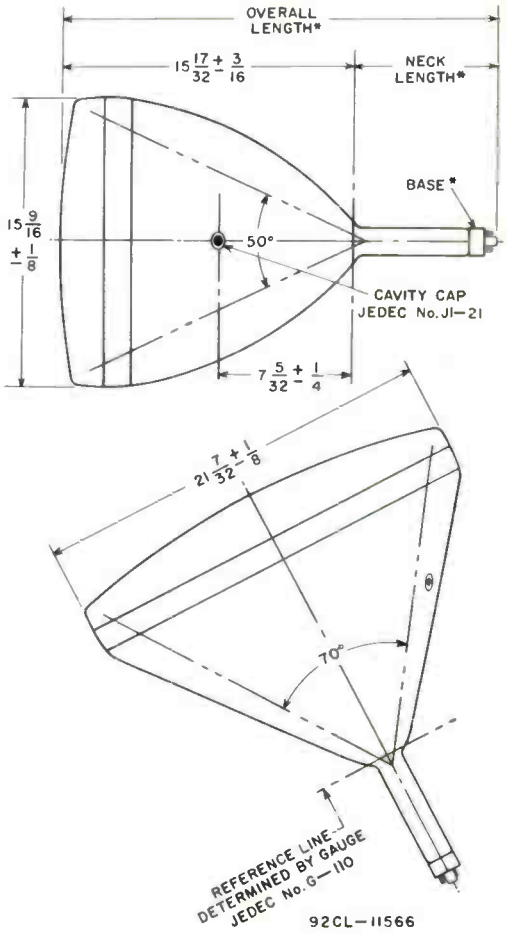
Dimensional Outline

FOR PICTURE TUBES UTILIZING





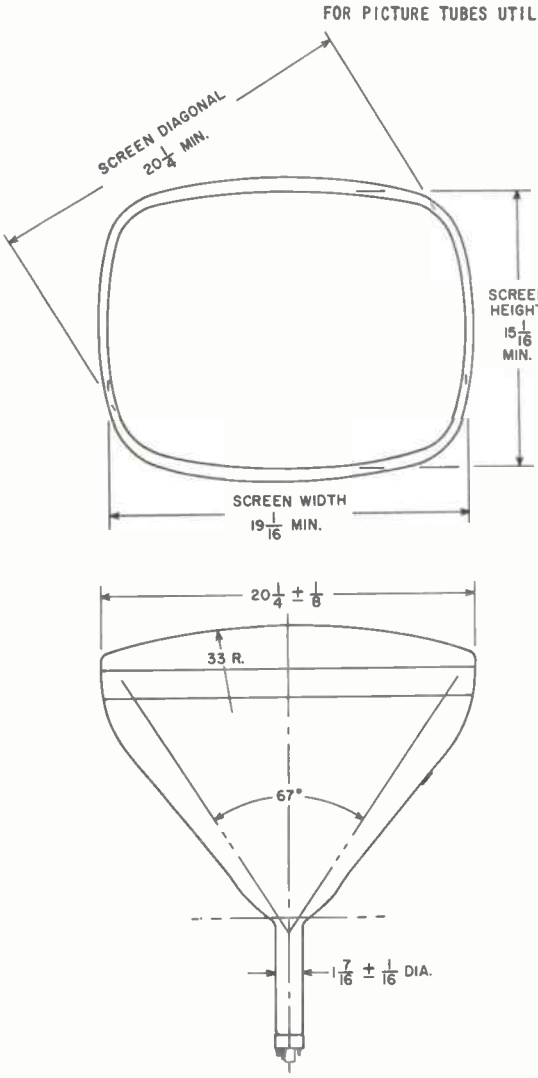
BULB J170 B/D



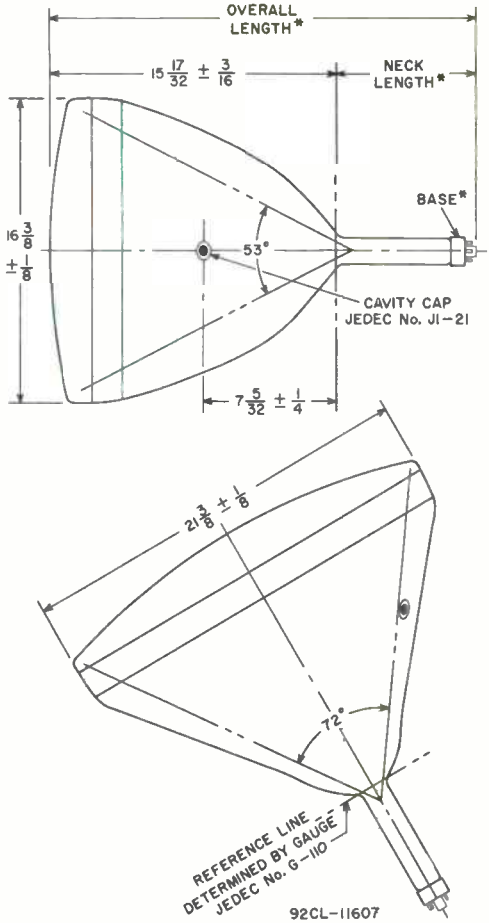
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

Dimensional Outline



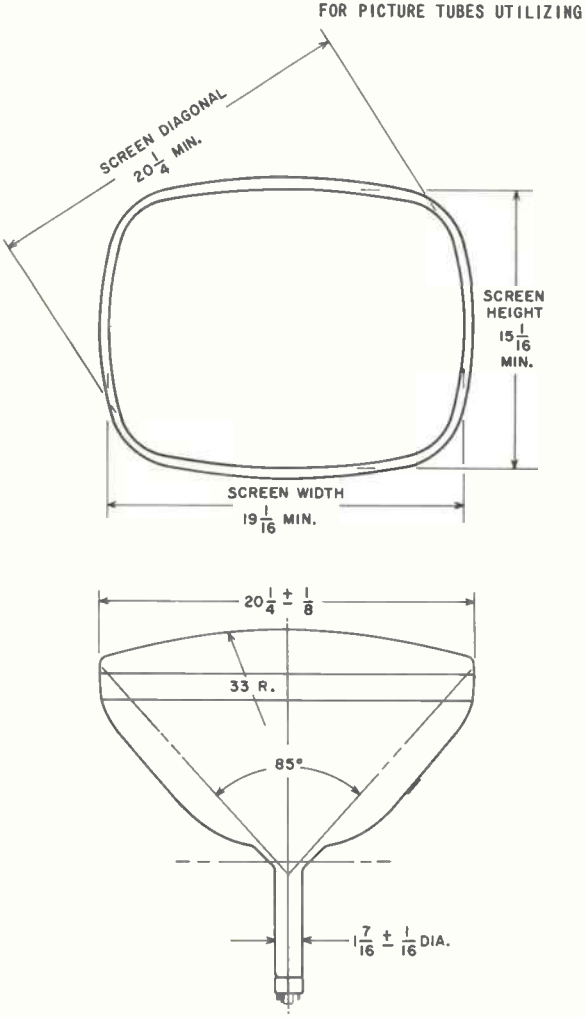
BULB J171 B/F



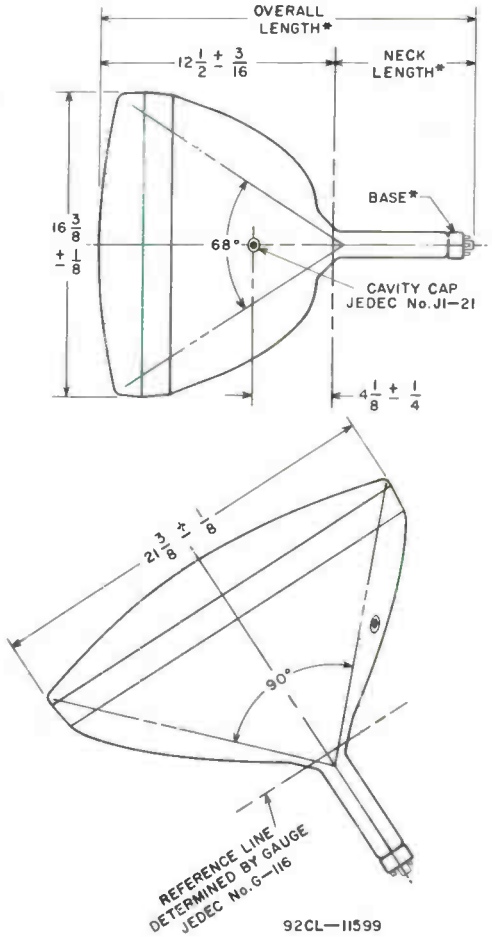
ALL DIMENSIONS IN INCHES

*See data for specific tube type.

Dimensional Outline



BULB J171 D/E

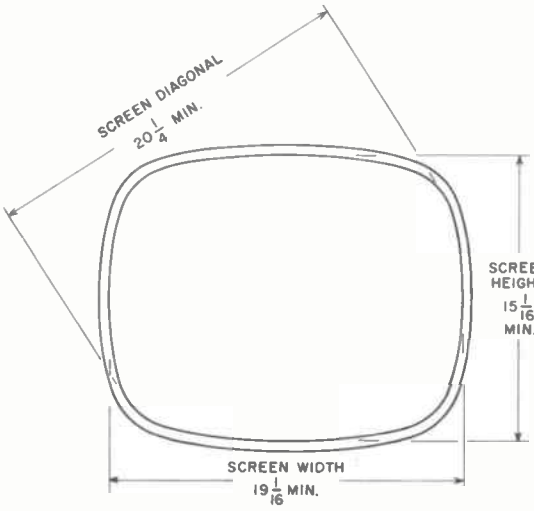


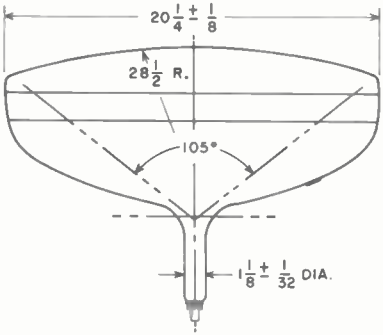
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

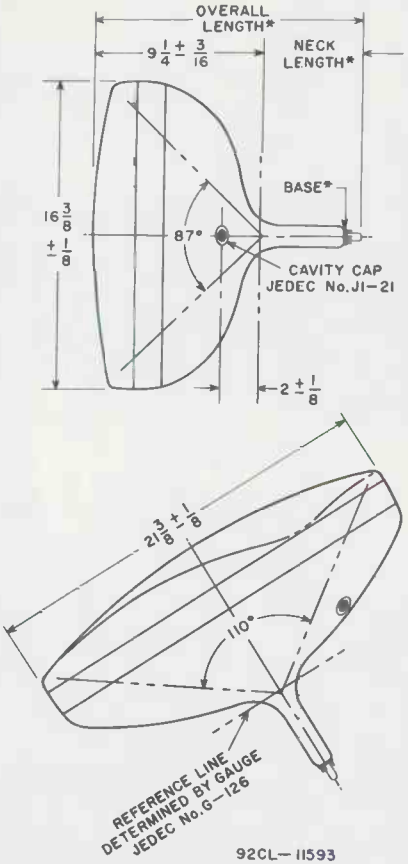
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J171 G/K

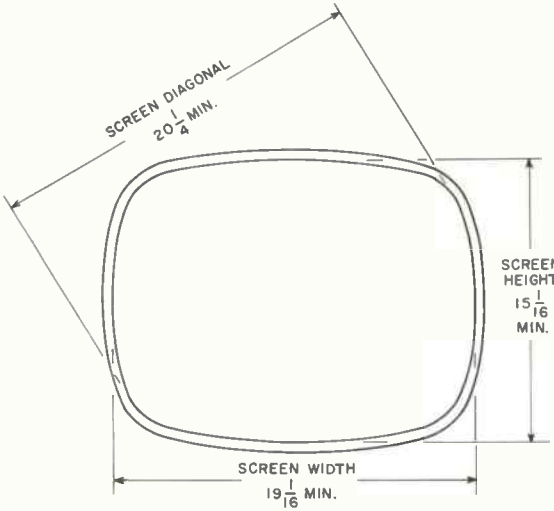


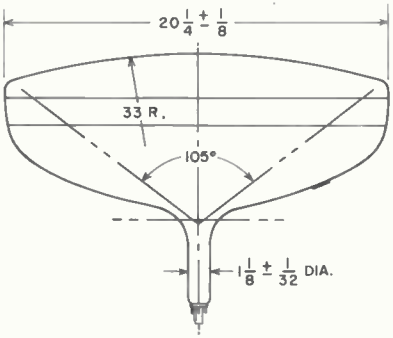
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

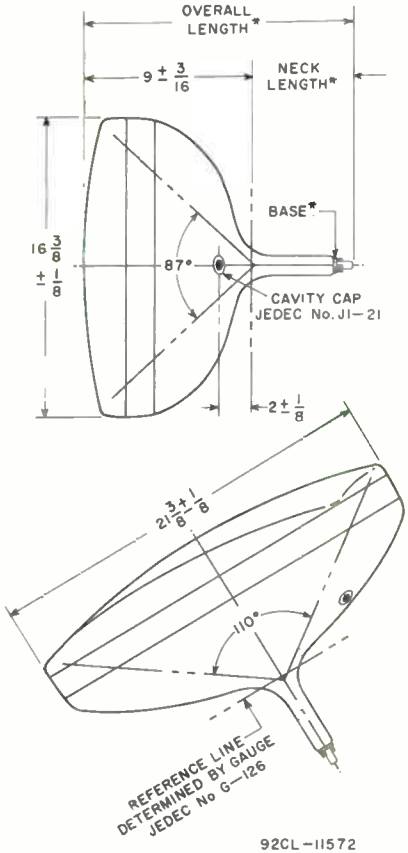
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J171 H/J

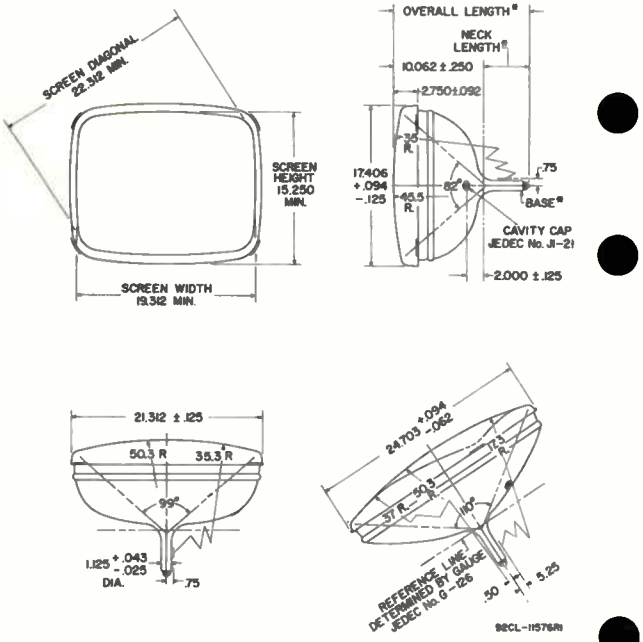


DIMENSIONS IN INCHES

*See data for specific tube type.

Dimensional Outline — Bulb J187 A

FOR PICTURE TUBES UTILIZING BULB J187A
AND PROTECTIVE PANEL FP198



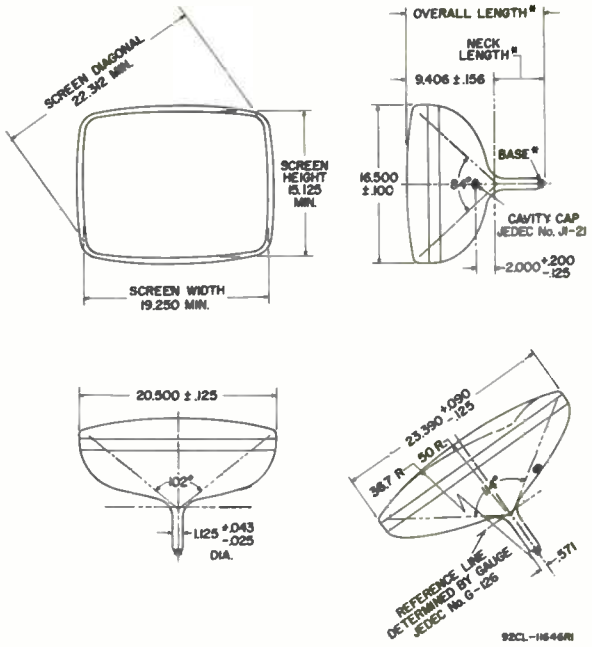
DIMENSIONS IN INCHES

* See data for specific tube type.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

Dimensional Outline — Bulb J187 B

FOR PICTURE TUBES UTILIZING BULB J187 B

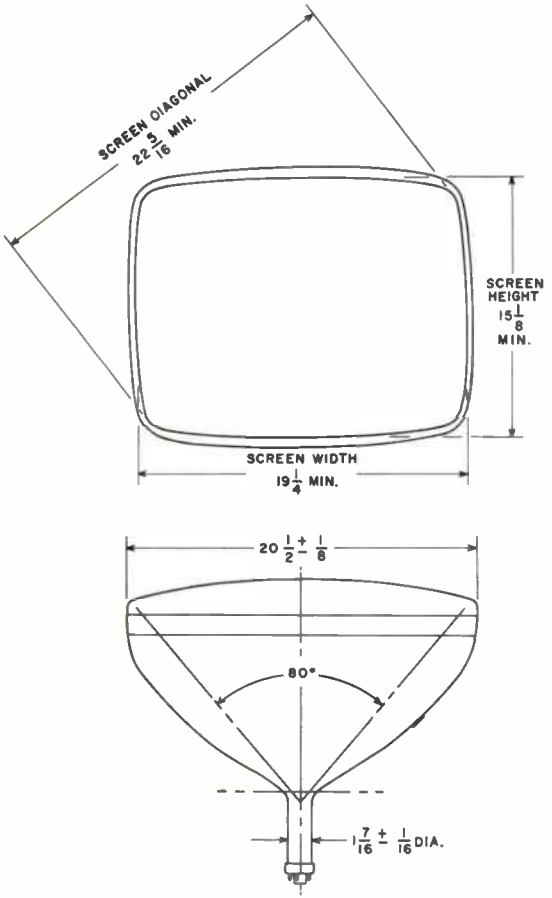


DIMENSIONS IN INCHES

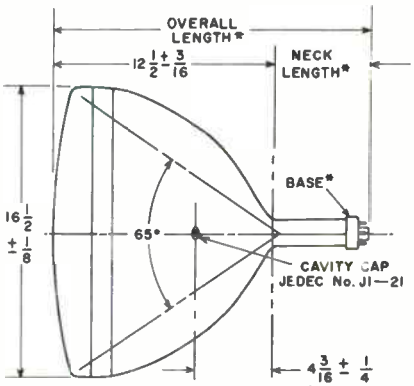
* See data for specific tube type.

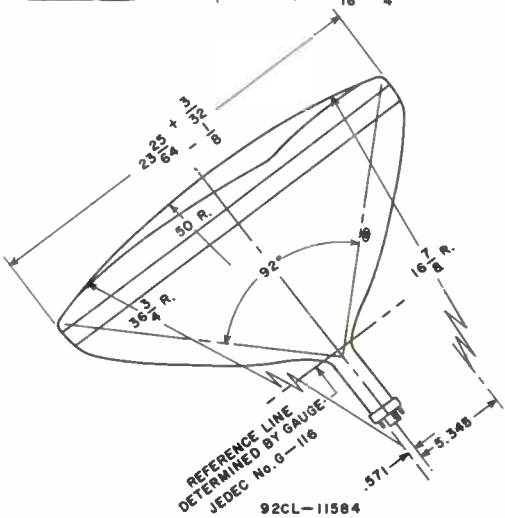
Dimensional Outline

FOR PICTURE TUBES UTILIZING BULB J187 C/F



BULB J187 C/F



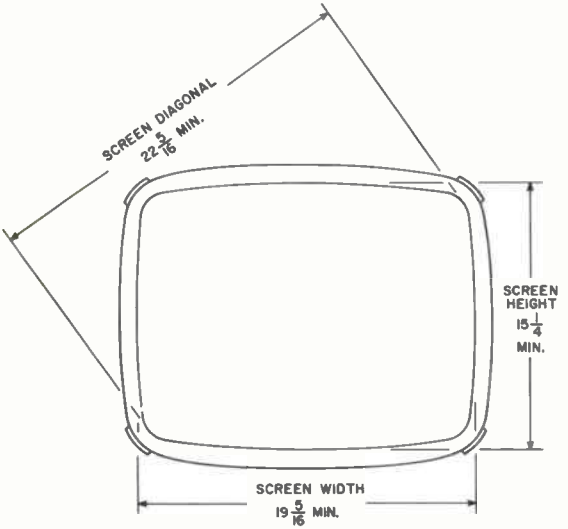


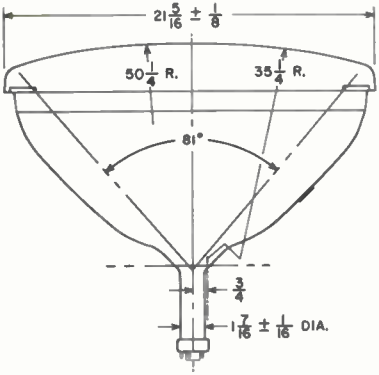
ALL DIMENSIONS IN INCHES

* See data for specitic tube type.

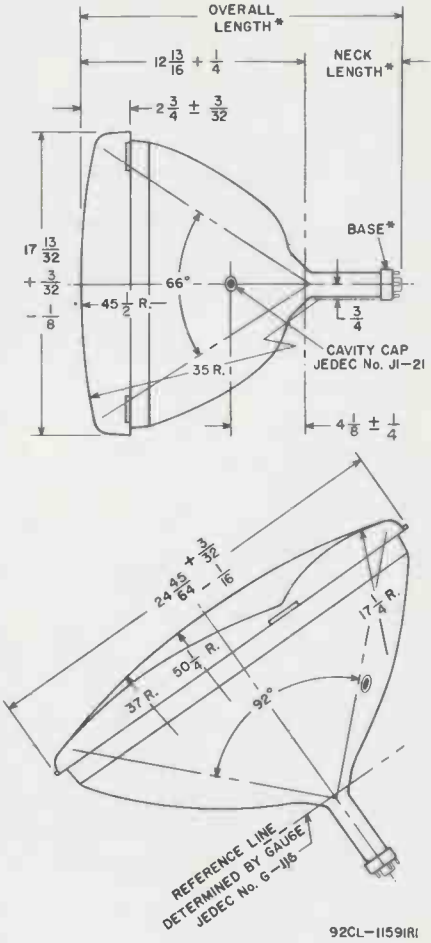
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J187 D/G AND PROTECTIVE PANEL

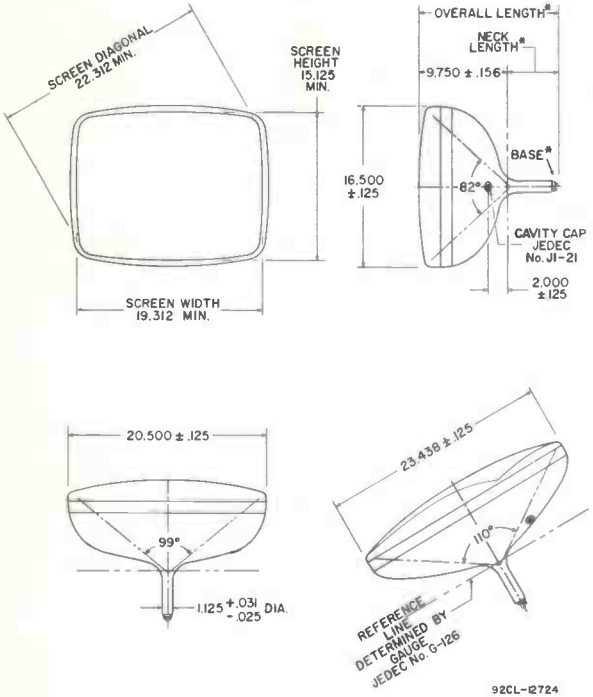


DIMENSIONS IN INCHES

*See data for specific tube type.

Dimensional Outline — Bulb J187 E

FOR PICTURE TUBES UTILIZING BULB J187 E

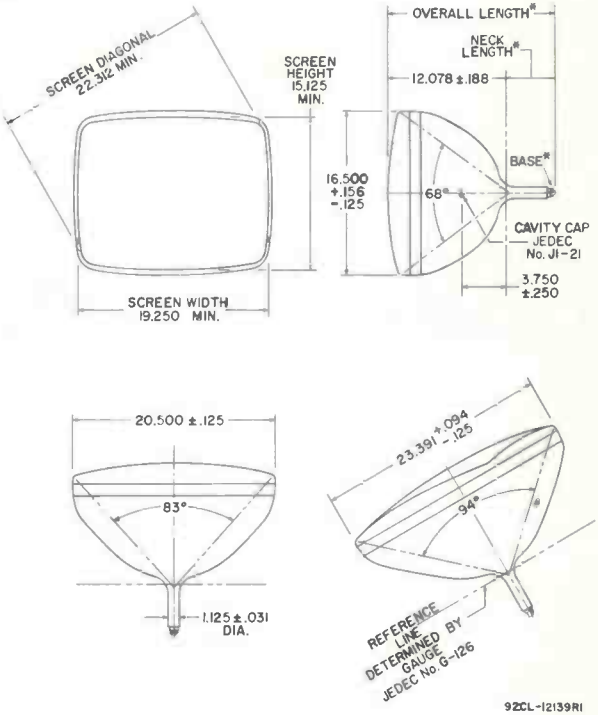


DIMENSIONS IN INCHES

*See data for specific tube type.

Dimensional Outline Bulb J187 H1

FOR PICTURE TUBES UTILIZING BULB J187 H1

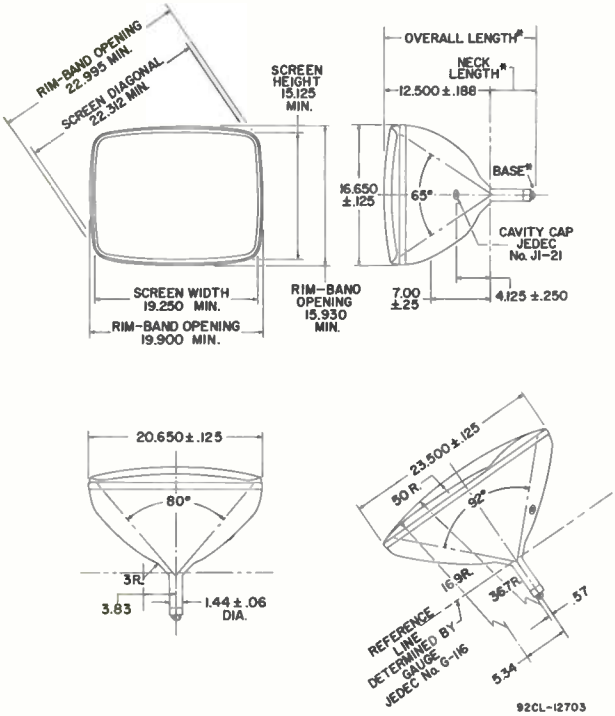


DIMENSIONS IN INCHES

*See data for specific tube type.

Dimensional Outline — Bulb J187 J

FOR PICTURE TUBES UTILIZING BULB J1B7 J

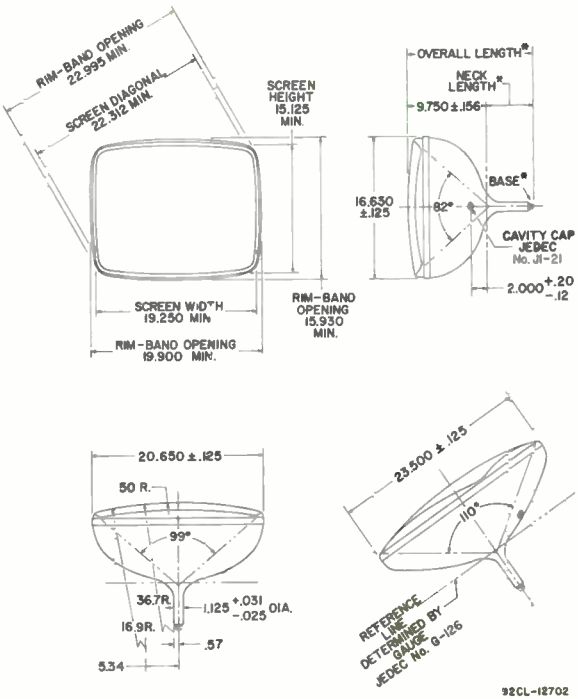


DIMENSIONS IN INCHES

*See data for specific tube type.

Dimensional Outline — Bulb J187 K

FOR PICTURE TUBES UTILIZING BULB J187 K

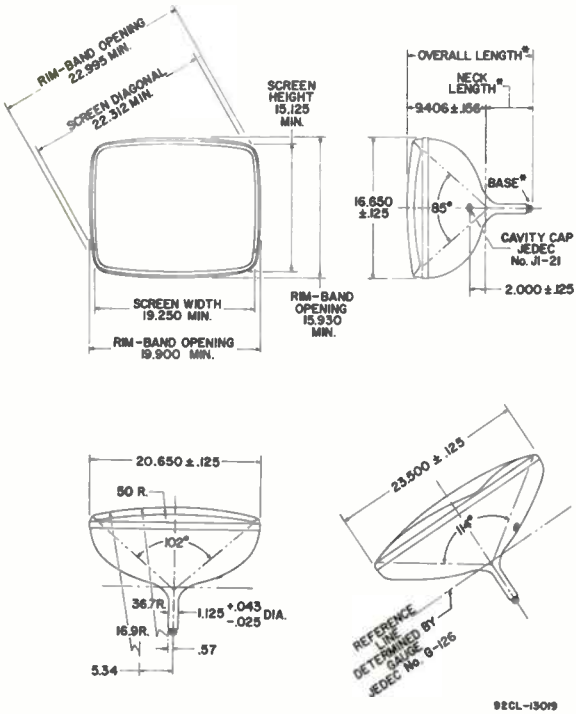


DIMENSIONS IN INCHES

*See data for specific tube type.

Dimensional Outline — Bulb J187 L

FOR PICTURE TUBES UTILIZING BULB J187 L



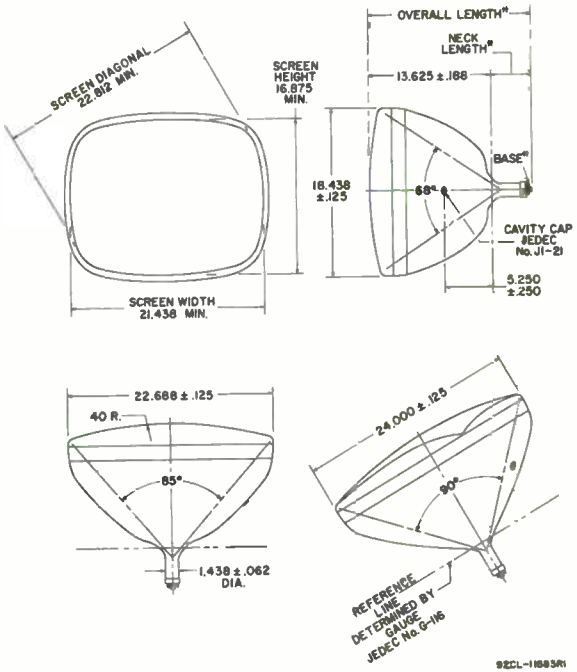
DIMENSIONS IN INCHES

*See data for specific tube type.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

Dimensional Outline Bulb J192 A/B

FOR PICTURE TUBES UTILIZING BULB J192 A/B

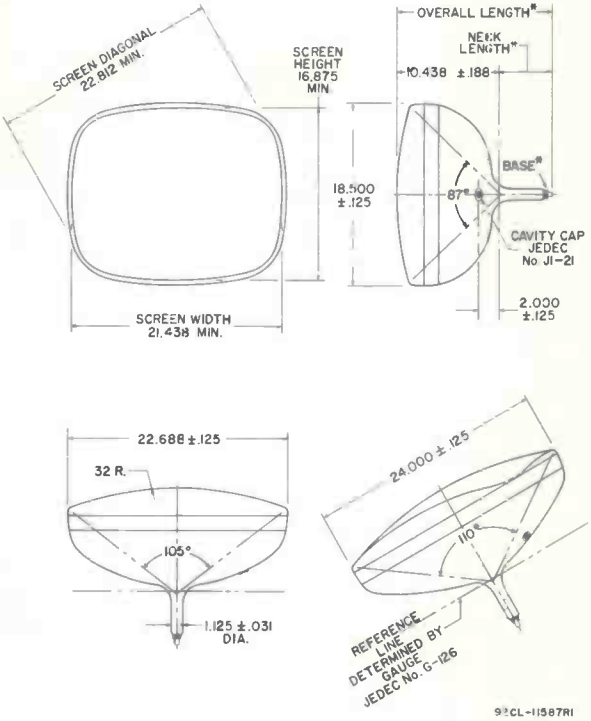


DIMENSIONS IN INCHES

*See data for specific tube type.

Dimensional Outline Bulb J192 C/D

FOR PICTURE TUBES UTILIZING BULB J192 C/D

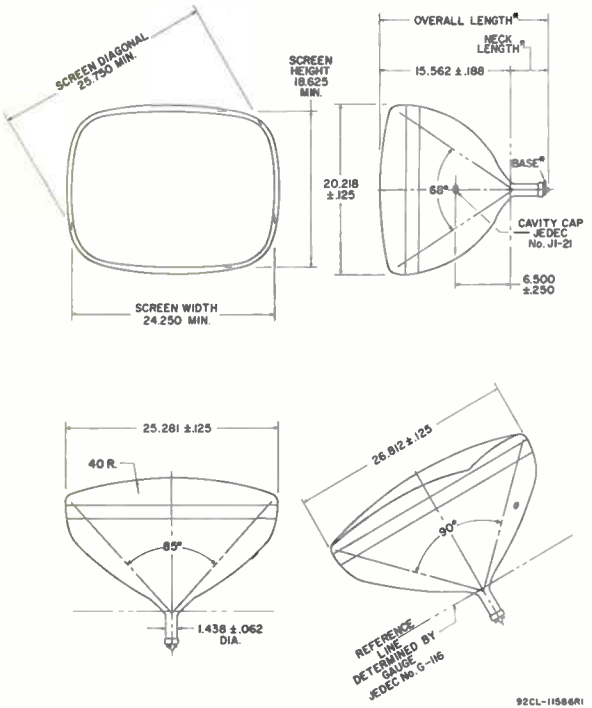


DIMENSIONS IN INCHES

*See data for specific tube type.

Dimensional Outline Bulb J214-1/2 A

FOR PICTURE TUBES UTILIZING BULB J214-1/2 A

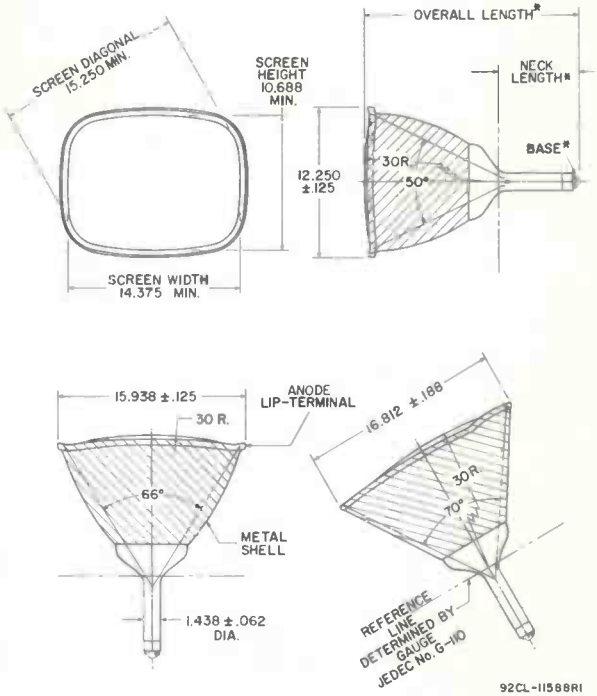


DIMENSIONS IN INCHES

*See data for specific tube type.

Dimensional Outline Bulb MJ135 A

FOR PICTURE TUBES UTILIZING BULB MJ135 A

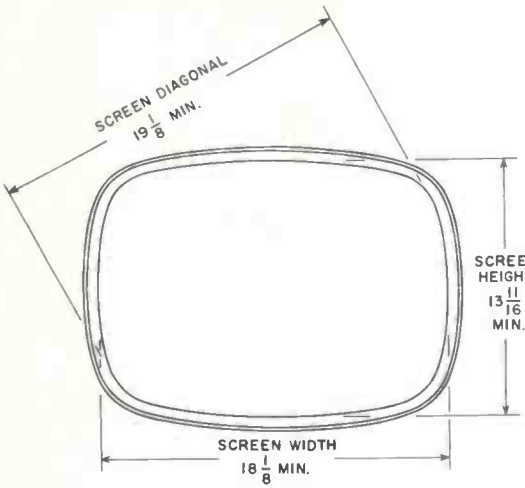


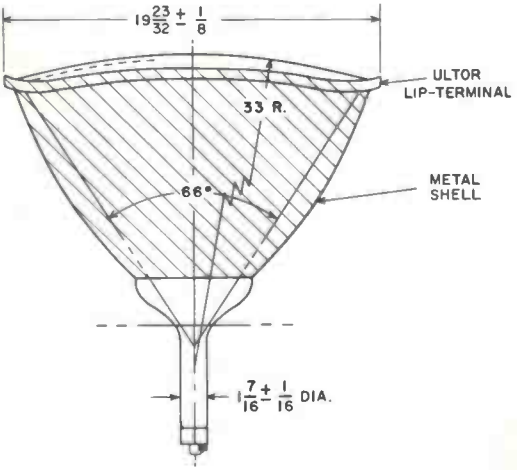
DIMENSIONS IN INCHES

*See data for specific tube type.

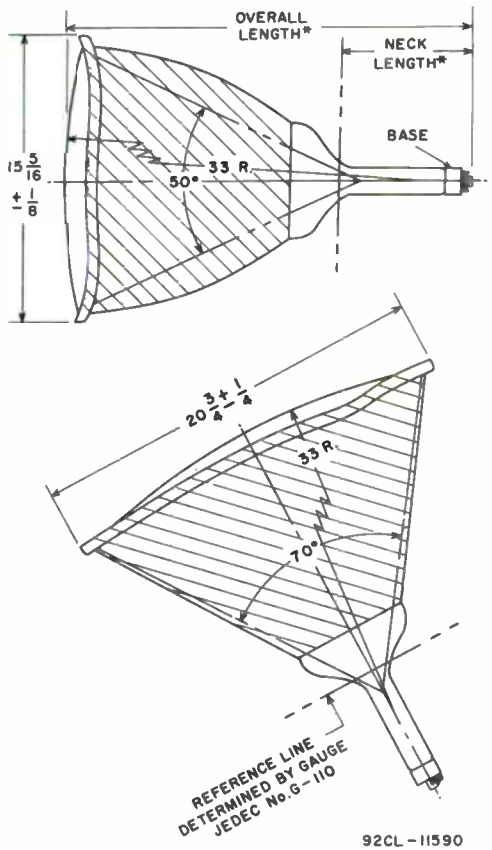
Dimensional Outline

FOR PICTURE TUBES UTILIZING 8UL8 MJ166 A





BULB MJ166 A

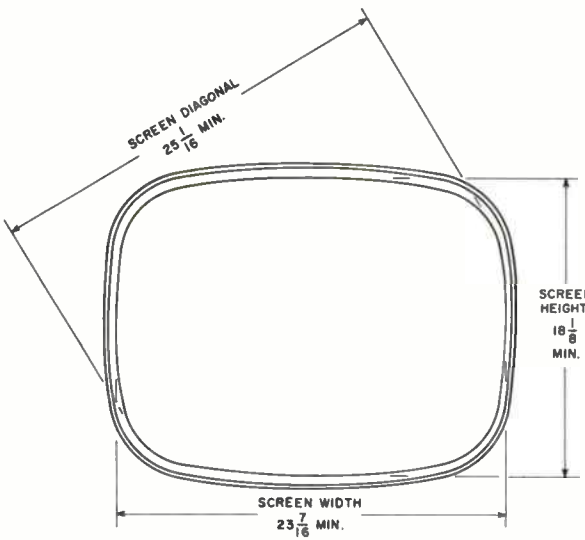


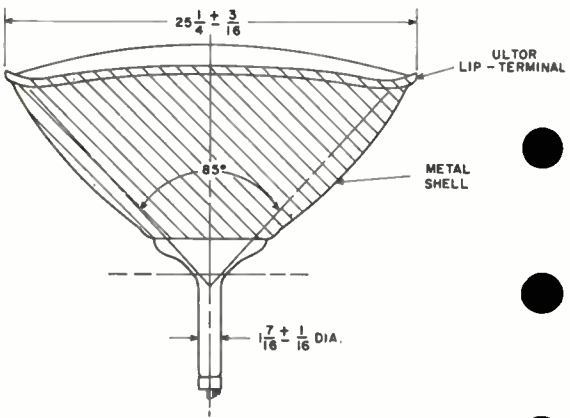
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

Dimensional Outline

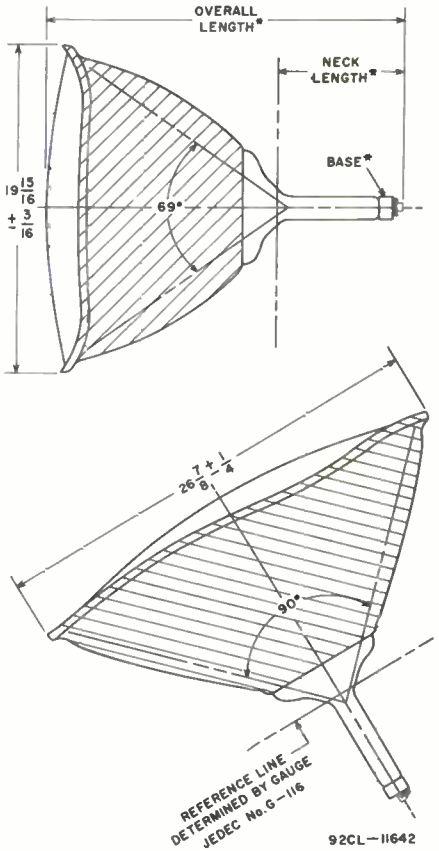
FOR PICTURE TUBES UTILIZING





RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

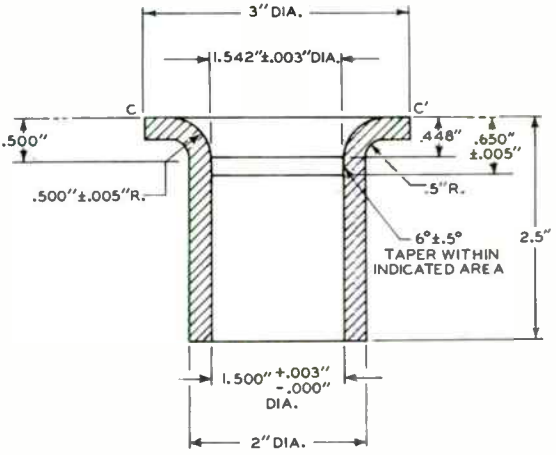
BULB MJ214 A



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

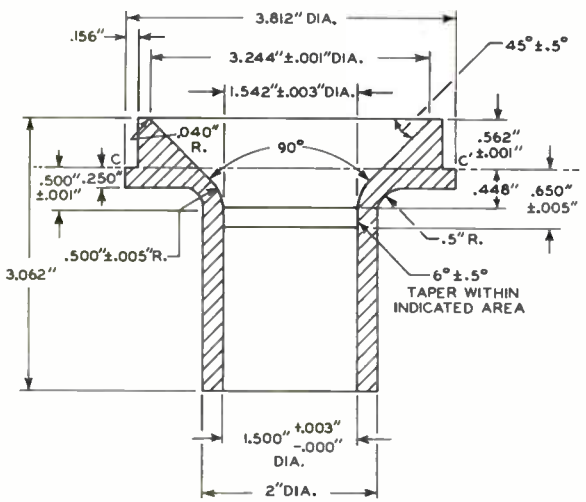
REFERENCE-LINE GAUGE
JETEC Nº G-110



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

92CS-7391RI

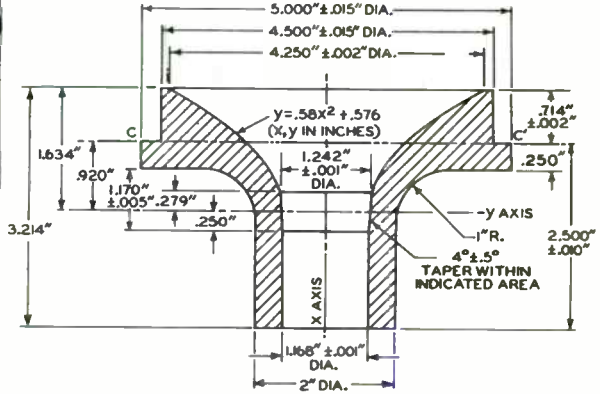
REFERENCE-LINE GAUGE
JETEC Nº G-116



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

92CS-7896R1

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-9145RI

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

X-Radiation Precautions

For Cathode-Ray Tubes

WARNING

All types of cathode-ray 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.

RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.

IEPI

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS — ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to all other electrodes	6.5	μμf
Deflecting electrode DJ_1 to deflecting electrode DJ_2	1.7	μμf
Deflecting electrode DJ_3 to deflecting electrode DJ_4	0.6	μμf
DJ_1 to all other electrodes	5	μμf
DJ_2 to all other electrodes	5	μμf
DJ_3 to all other electrodes	3.8	μμf
DJ_4 to all other electrodes	3.8	μμf
Faceplate, Flat	Clear Glass	
Phosphor (For Curves, see front of this Section)	P1	
Fluorescence	Green	
Phosphorescence	Green	
Persistence	Medium	
Focusing Method	Electrostatic	
Deflection Method	Electrostatic	
Maximum Overall Length	4-1/16"	
Maximum Diameter	1-1/4" ± 1/16"	
Minimum Useful Screen Diameter	1-1/16"	
Mounting Position	Any	
Weight (Approx.)	2 oz	
Bulb	T-10	
Base	Small-Button Unidekar 11-Pin (JETEC No.E11-22)	
Basing Designation for BOTTOM VIEW	11V	

Pin 1 – Heater
Pin 2 – Heater
Pin 3 – Grid No.1
Pin 4 – Cathode
Pin 5 – Grid No.3
Pin 6 – Deflecting Electrode DJ_4
Pin 7 – Deflecting Electrode DJ_3

Pin 8 – Ultor (Grid No.2, Grid No.4, Collector)
Pin 9 – Deflecting Electrode DJ_2
Pin 10 – Deflecting Electrode DJ_1
Pin 11 – Internal Connection – Do Not Use

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

TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

RCA

1EP1

OSCILLOGRAPH TUBE

With DJ_2 positive with respect to DJ_1, the spot is deflected toward the midpoint between pins 6 and 7. With DJ_3 positive with respect to DJ_4, the spot is deflected toward the midpoint between pins 9 and 10.

The angle between the trace produced by DJ_3 and DJ_4 and its intersection with the plane through the tube axis and the midpoint between pins 9 and 10 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° ± 3°.

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	1500 max.	volts
GRID-No.3 VOLTAGE	1200 max.	volts
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 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 ultor voltage (E_{c_4}) between recommended minimum and 1500 volts*

Grid-No.3 Voltage for Focus	10% to 30% of E_{c_4}	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	−1.4% to −4.2% of E_{c_4}	volts
Grid-No.3 Current for Any Operating Condition	−15 to +10	μamp
Deflection Factors:		
DJ_1 & DJ_2	210 to 310 v dc/in./kv of E_{c_4}	
DJ_3 & DJ_4	240 to 350 v dc/in./kv of E_{c_4}	
Spot Position	##	

Examples of Use of Design Ranges:

For ultor voltage of	*500*	*1000*	*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 1EP1 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.

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IEPI

OSCILLOGRAPH TUBE

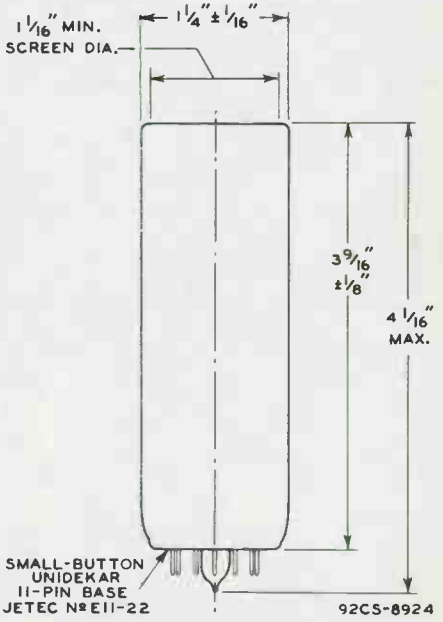
For ultor voltage of	*500*	*1000*	*volts*
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-7 to -21	-14 to -42	volts
Deflection Factors:			
DJ_1 & DJ_2	105 to 155	210 to 310	volts dc/in.
DJ_3 & DJ_4	120 to 175	240 to 350	volts dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting-Electrode Circuit##	2.0 max.	megohms

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 be approximately equal.



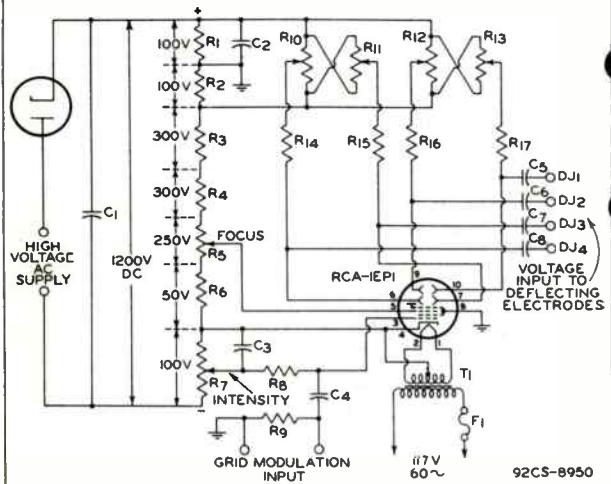
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

IEPI

IEPI

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.5 μf, 2000 volts
C2: 1 μf, 200 volts
C3: 1 μf, 200 volts
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 potentiometer
R6: 51,000 ohms, 1/2 watt
R7: 100,000-ohms, 1/2-watt potentiometer
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, 1/2 watt
T1: Transformer, 6.3 volts at 1 ampere, insulated for 2000 volts, such as Thordarson T21F08
F1: 1-ampere fuse

TUBE DIVISION
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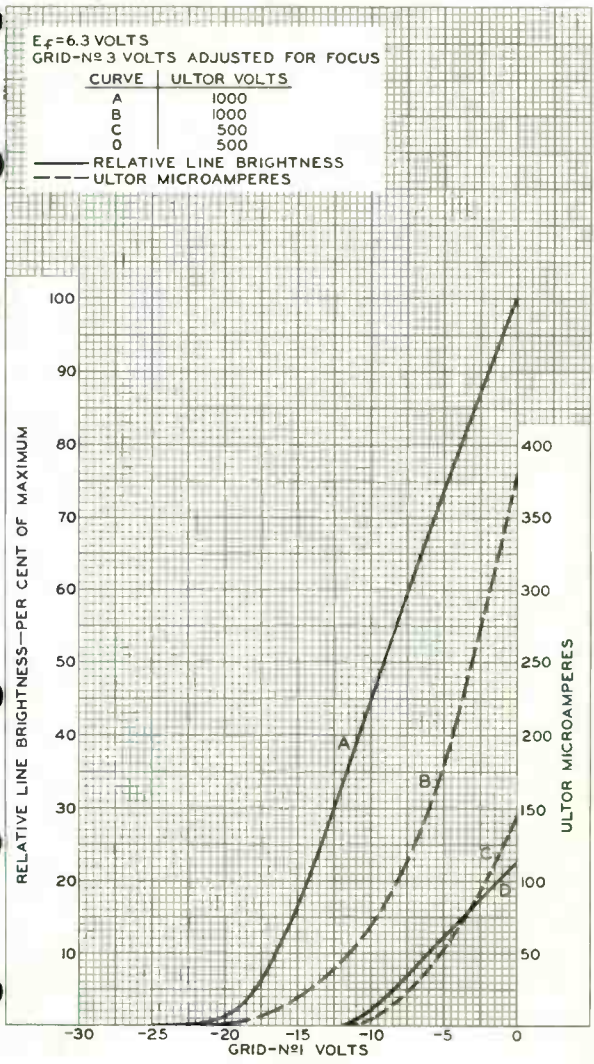
IEPI

AVERAGE CHARACTERISTICS



TUBE DIVISION
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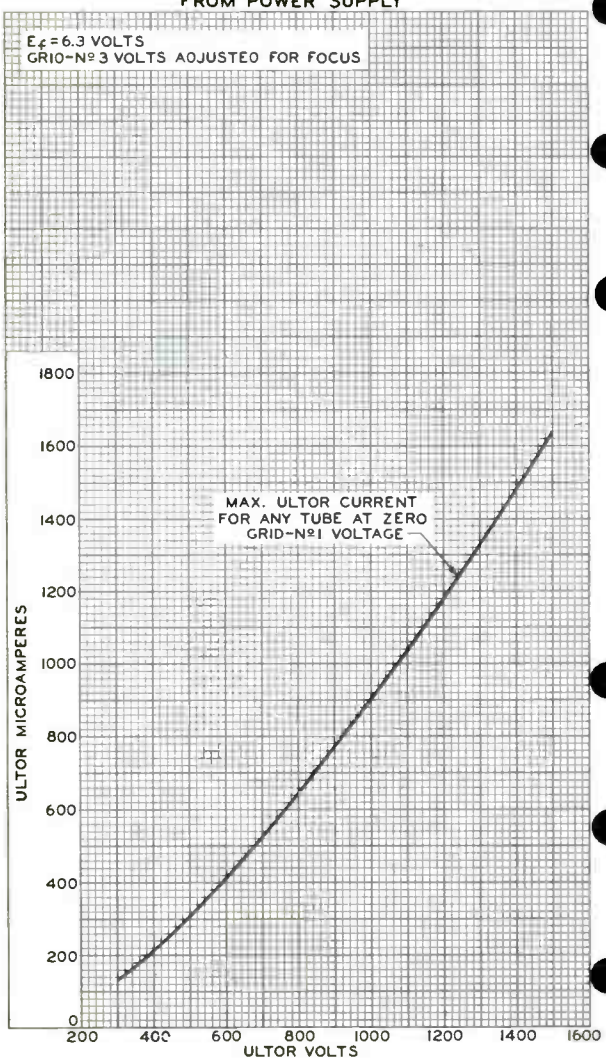
92CM-8938

IEPI

RCA

IEPI

MAXIMUM ULTOR-CURRENT REQUIREMENTS
FROM POWER SUPPLY



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92CM-8939

RCA

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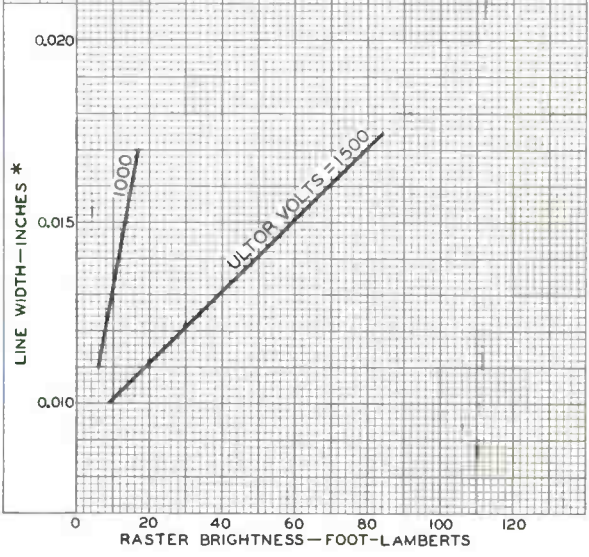
AVERAGE CHARACTERISTICS

E_f = 6.3 VOLTS
GRID-№3 VOLTS ADJUSTED FOR SHARP FOCUS AT CENTER OF RASTER.
GRID-№1 VOLTS ADJUSTED TO GIVE INDICATED BRIGHTNESS VALUE ON A 2 CM x 2 CM, 25-LINE RASTER.
* LINE WIDTH MEASURED BETWEEN POINTS WHERE BRIGHTNESS WAS APPROX. 1/2 THAT AT CENTER OF LINE.



1EP2

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

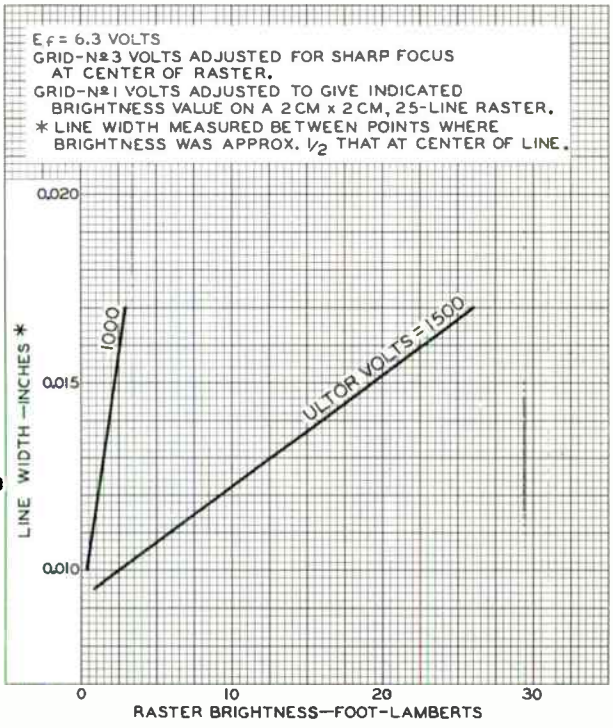
The 1EP2 is the same as the 1EP1 except for the following items:

General:

Phosphor (For Curves, see front of this Section). P2
Fluorescence. . . . . Greenish-Yellow
Phosphorescence . . . . . Greenish-Yellow
Persistence . . . . . Long

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

AVERAGE CHARACTERISTICS

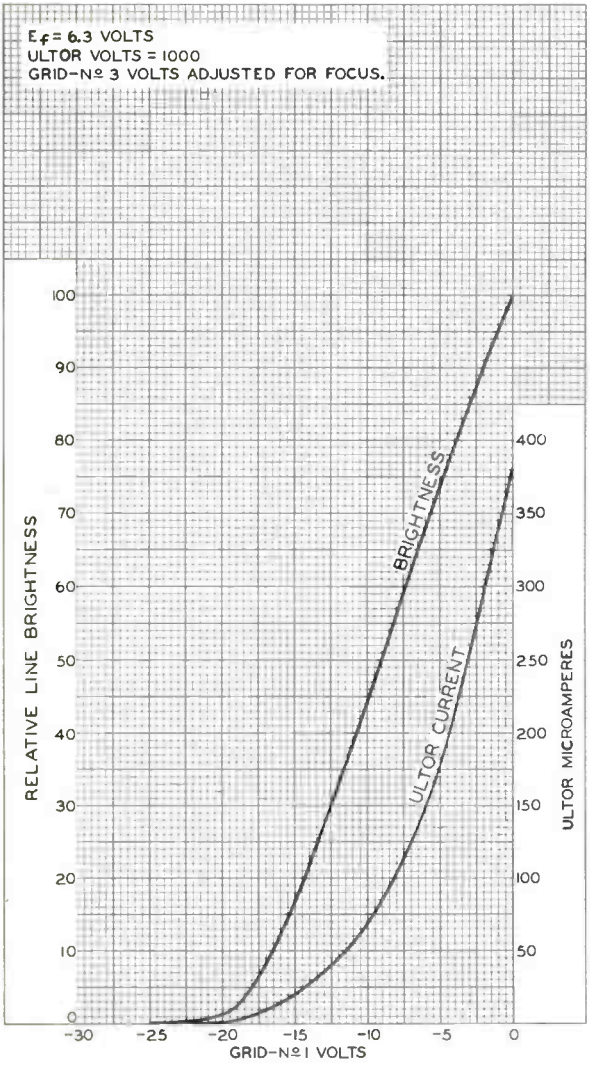


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-9189

RCA

1EP2

AVERAGE CHARACTERISTICS



TUBE DIVISION
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92CM-9298

RCA

1EP11

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

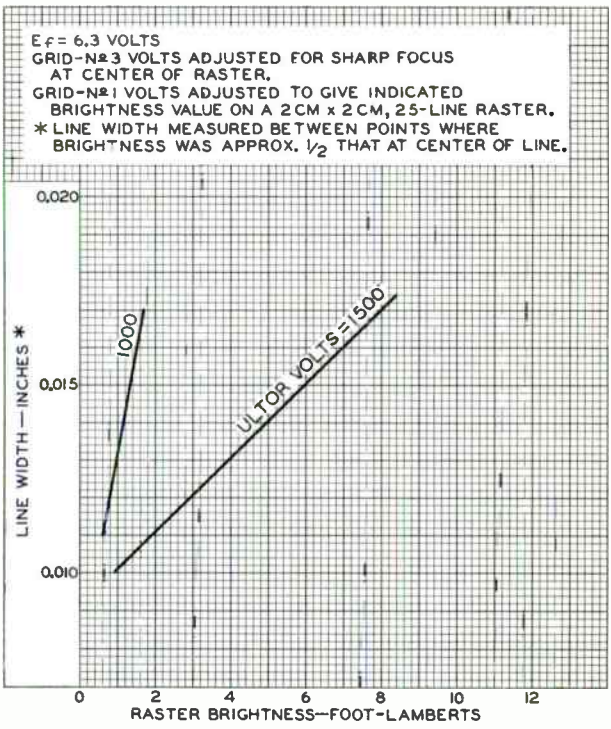
The 1EP11 is the same as the 1EP1 except for the following items:

General:

Phosphor (For Curves, see front of this Section)	P11
Fluorescence	Blue
Phosphorescence	Blue
Persistence	Short

In general, operation of the 1EP11 at an ultor voltage less than 750 volts is not recommended.

AVERAGE CHARACTERISTICS



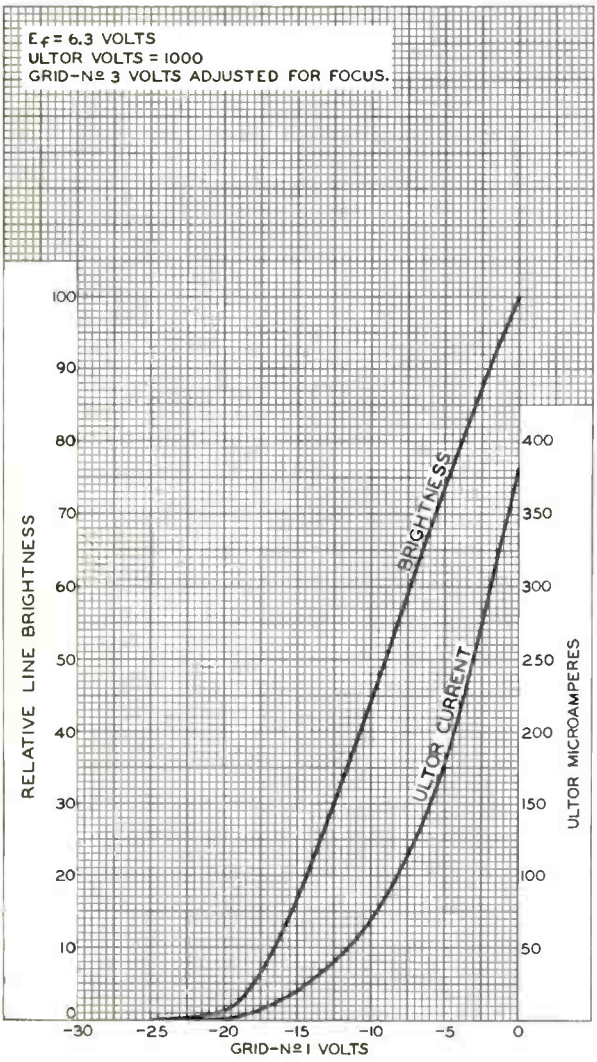
92CM-9188

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON NEW JERSEY

RCA

1EP11

AVERAGE CHARACTERISTICS



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

2API-A

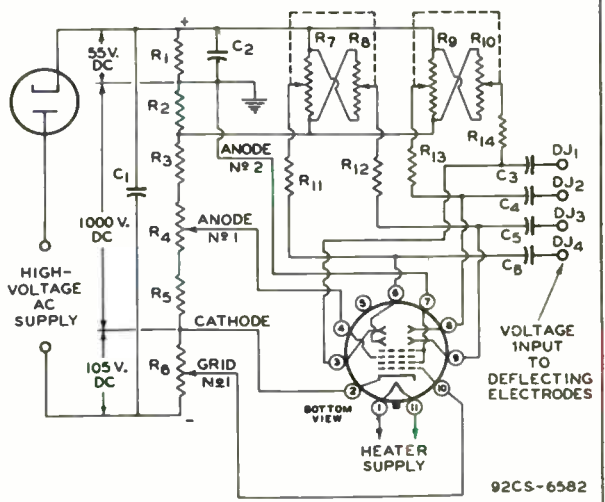
HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

Resistance in Any Deflecting-Electrode Circuit▲▲ 5.0 max. megohms

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

TYPICAL OSCILLOGRAPH CIRCUIT

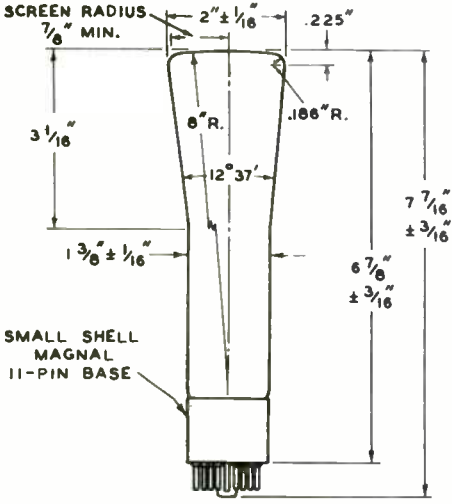


C1: 0.1 μf
C2: 1.0 μf
C3 C4 C5 C6: 0.05-μf Blocking Capacitor*
R1 R2: 0.5 Megohm
R3: 3.0 Megohms
R4: 1.0-Megohm Potentiometer
R5: 0.5 Megohm
R6: 0.5-Megohm Potentiometer
R7 R8: Dual 5-Megohm Potentiometer
R9 R10: Dual 5-Megohm Potentiometer
R11 R12 R13 R14: 2 Megohms

* 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-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.

2AP1-A

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

2API-A

HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 2AP1

General:

Heater, for Unipotential Cathode:		
Voltage	6.3 ± 10%	ac or dc volts
Current	0.6	amp.
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to All Other Electrodes	8.0	μμf
Cathode to All Other Electrodes	5.5	μμf
DJ_1 to DJ_2	0.6	μμf
DJ_3 to DJ_4	1.1	μμf
DJ_1 to All Other Electrodes	8.5	μμf
DJ_3 to All Other Electrodes	9.0	μμf
DJ_1 to All Other Electrodes except DJ_2	8.0	μμf
DJ_2 to All Other Electrodes except DJ_1	4.6	μμf
DJ_3 to All Other Electrodes except DJ_4	7.5	μμf
DJ_4 to All Other Electrodes except DJ_3	6.0	μμf
Phosphor (For Curves, see front of this Section)		No.1
Fluorescence		Green
Persistence		Medium
Focusing Metnod		Electrostatic
Deflection Method		Electrostatic
Overall Length		7-7/16" ± 3/16"
Greatest Diameter of Bulb		2" ± 1/16"
Minimum Useful Screen Diameter		1-3/4"
Mounting Position		Any
Base		Small Shell Magnal 11-Pin
Basing Designation for BOTTOM VIEW		11L

Pin 1 – Heater
Pin 2 – Cathode
Pin 3 – Deflecting Electrode DJ_1
Pin 4 – Anode No.1
Pin 5 – No Connection
Pin 6 – Deflecting Electrode DJ_4
Pin 7 – Anode No.2, Grid No.2

Pin 8 – Deflecting Electrode DJ_2
Pin 9 – Deflecting Electrode DJ_3
Pin 10 – Grid No.1
Pin 11 – Heater

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 is deflected toward pin 4. With DJ_3 positive with respect to DJ_4, the spot is deflected toward pin 1.

The angle between the trace produced by DJ_3 and DJ_4 and its intersection with the plane through the tube axis and pin 1 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° ± 4°.

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

2API-A

2API-A

HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

Maximum Ratings, *Absolute Values*:

ANODE-No.2 & GRID-No.2 VOLTAGE	1100 *max.*	volts
ANODE-No.1 VOLTAGE	550 *max.*	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative Value	125 *max.*	volts
Positive Value	0 *max.*	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE	660 *max.*	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 *max.*	volts
Heater positive with respect to cathode	10 *max.*	volts

Typical Operation:

Anode-No.2 & Grid-No.2 Voltage★	500	1000	volts
Anode-No.1 Voltage for Focus at 75% of Grid-No.1 Voltage for Cutoff●	125	250	volts
Grid-No.1 Volt. for Visual Cutoff#	−30	−60	volts
Max. Anode-No.1 Current Range▲	Between −50 and +10		μamp.
Deflection Sensitivity:			
DJ_1 and DJ_2	0.220	0.110	mm/v dc
DJ_3 and DJ_4	0.260	0.130	mm/v dc
Deflection Factor:**			
DJ_1 and DJ_2	115	230	v dc/in.
DJ_3 and DJ_4	98	196	v dc/in.

★ 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 ± 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 10-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ_1 and DJ_2. Suitable test conditions are: anode-No.2 voltage, 1000 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 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

2BP1
OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Uniootential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6	amp
Direct Interelectrode Capacitances (Aporox.):		
Grid No.1 to All Other Electrodes	8	μμf
DJ_1 to DJ_2	2	μμf
DJ_3 to DJ_4	2	μμf
DJ_1 to All Other Electrodes	11	μμf
DJ_2 to All Other Electrodes	8	μμf
DJ_3 to All Other Electrodes	7	μμf
DJ_4 to All Other Electrodes	8	μμf ←
Phosohor (For Curves, see front of this Section)		No.1
Fluorescence		Green
Persistence		Medium
Focusing Method		Electrostatic
Deflection Method		Electrostatic
Overall Length		7-5/8" ± 3/16"
Greatest Diameter of Bulb		2" ± 1/16"
Minimum Useful Screen Diameter		1-3/4"
Mounting Position		Any
Base		Small-Shell Duodecal 12-Pin
Basing Designation for BOTTOM VIEW		12E

Pin 1 – Heater
Pin 2 – Grid No.1
Pin 3 – Cathode
Pin 4 – Anode No.1
Pin 5 – Internal Connection-- Do Not Use
Pin 6 – Deflecting Electrode DJ_3
Pin 7 – Deflecting Electrode DJ_4

Pin 8 – Anode No.2, Grid No.2
Pin 9 – Deflecting Electrode DJ_2
Pin 10 – Deflecting Electrode DJ_1
Pin 11 – Internal Connection-- Do Not Use
Pin 12 – Heater

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 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 10°.

The angle between DJ1 – DJ2 trace and DJ3 – DJ4 trace is 90° ± 3°.

← Indicates a change.

2BP1

2BP1

OSCILLOGRAPH TUBE

Maximum Ratings, *Design-Center Values:*

ANODE-No.2● VOLTAGE	2500 max.	volts
ANODE-No.1 VOLTAGE	1000 max.	volts
→ 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 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 (E_{b_2}) between 500 and 2500 volts*

Anode-No.1 Voltage	15% to 28% of E_{b_2}	volts
→ Max. Grid-No.1 Voltage for Visual Cutoff	6.75% of E_{b_2}	volts
Max. Anode-No.1 Current Range	−15 to +10	microamperes
Deflection Factors:		
DJ_1 & DJ_2	115 to 155	v dc/in./kv of E_{b_2}
DJ_3 & DJ_4	74 to 100	v dc/in./kv of E_{b_2}
→ 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 Cutoff	−67.5	−135	volts
Deflection Factors:			
DJ_1 & DJ_2	115 – 155	230 – 310	volts dc/in.
DJ_3 & DJ_4	74 – 100	148 – 200	volts dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting-Electrode Circuit○	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 deflection and low room-light levels.

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

● 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.

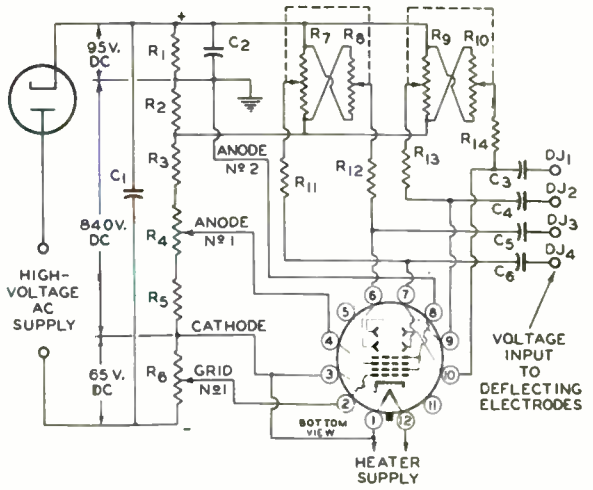
□ The center of the undeflected, focused spot will fall within a circle having a 5.0-mm radius concentric with the center of the tube face.

→ Indicates a change.

2BP1

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



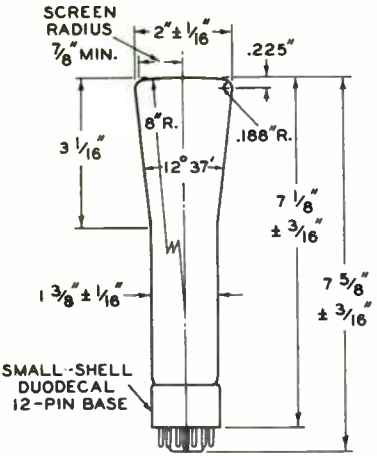
92CM-6777R1

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
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 R14: 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.

2BP1

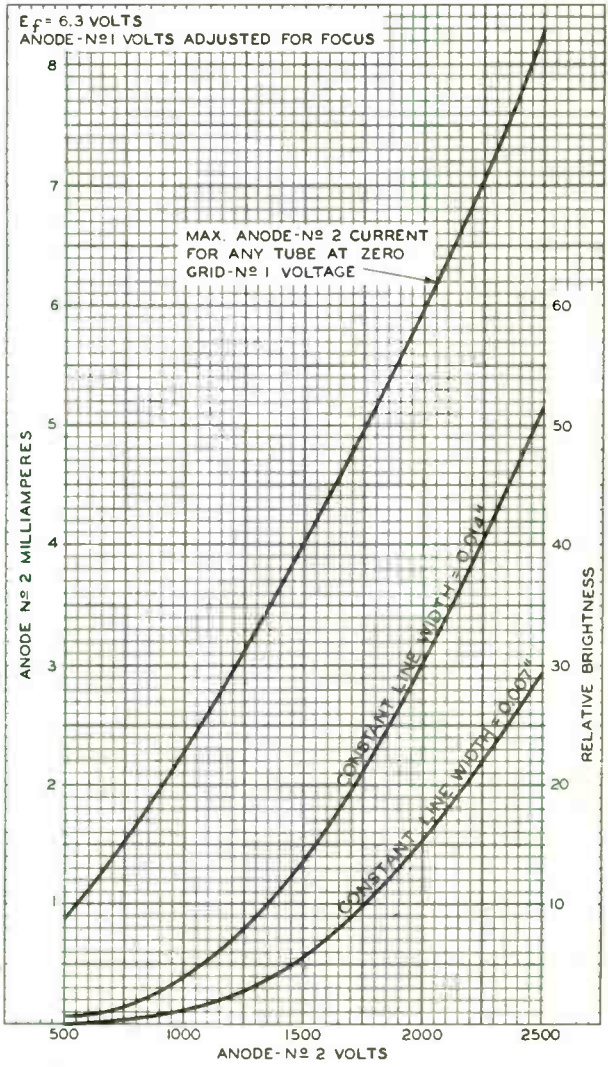
OSCILLOGRAPH TUBE



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

92CS-6689

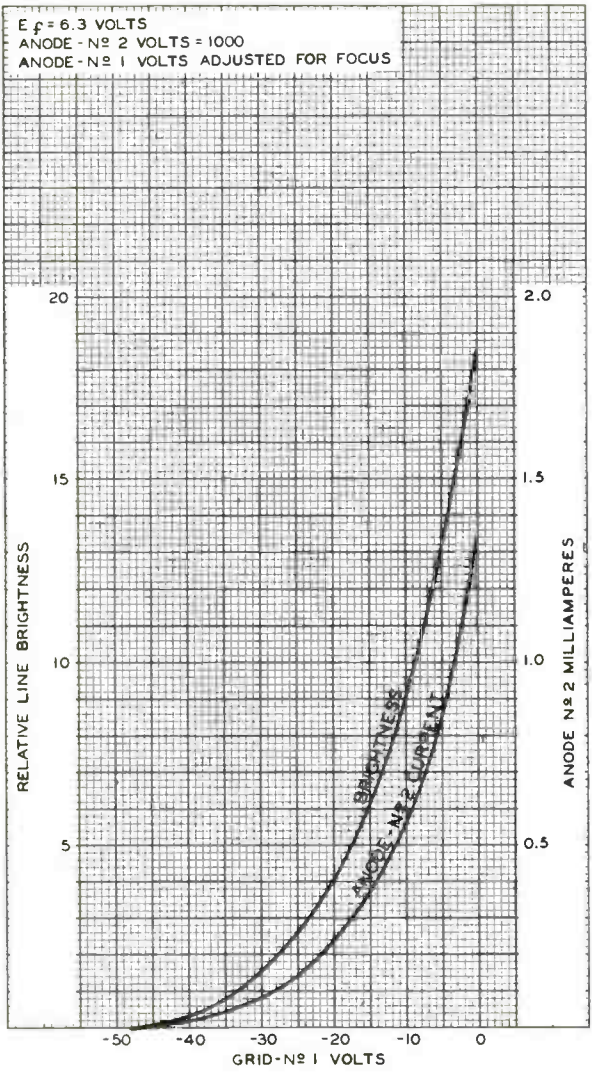
2BP1
CHARACTERISTICS



2BP1

2BP1

AVERAGE CHARACTERISTICS



AUGUST 14, 1950 TUBE DEPARTMENT 92CM-6747R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

2BP11

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 moves 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

2F21
MONOSCOPE

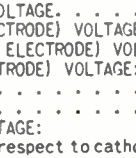
5-INCH MAGNETIC-DEFLECTION TYPE

Supersedes Type 1899

General:

Heater, for Unipotential Cathode:		
Voltage	6.3 ± 10%	ac or dc volts
Current	0.6	amp
Direct Interelectrode Capacitances:		
Grid No.1 to All Other Electrodes	7	μμf
Pattern Electrode to Grid No.4	5	μμf
Pattern:		
Type	See illustration on next page	
Dimensions (Approx.)	2-5/16" x 3-1/16"	
Calibration	Up to 500 lines	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Maximum Solid Deflection Angle	40°	
Overall Length	12-7/16" + 1/4" - 7/16"	
Greatest Diameter of Bulb	5-1/16" max.	
Caps (Two)	Recessed Small Ball	
Mounting Position	Any	
Base	Long-Shell Medium 6-Pin	
Basing Designation for BOTTOM VIEW	6BV	

Pin 1 - Heater
Pin 2 - Grid No.2
Pin 3 - Grid No.3
Pin 4 - Grid No.1
Pin 5 - Cathode



Pin 6 - Heater
End Cap - Pattern Electrode
Side Cap - Grid No.4

Maximum Ratings, *Design-Center Values*:

PATTERN-ELECTRODE VOLTAGE	1500 max.	volts
GRID-No.4 (COLLECTOR) VOLTAGE	1500 max.	volts
GRID-No.3 (FOCUSING ELECTRODE) VOLTAGE	600 max.	volts
GRID-No.2 (ACCELERATING ELECTRODE) VOLT.	1600 max.	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative Bias Value	125 max.	volts
Positive Bias Value	0 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: †

Pattern-Electrode Voltage	1000	volts
Grid-No.4 Voltage	1050	volts
Grid-No.3 Voltage for Focus at 0.5 μamp Grid-No.4 Current▲	300 approx.	volts
Grid-No.2 Voltage	1000	volts
Grid-No.1 Voltage for Visual Cutoff on Monitor#	-50 approx.	volts
Internal Resistance between Grid No.4 and Pattern Electrode	Greater than 1 meg.	
Grid-No.4 Current	0.5	μamp

†, ▲, #: See next page.

2F21
MONOSCOPE

Pattern-Electrode Signal Current (Peak-to-Peak)		0.5 approx. μamp
Resolution Capability▲▲	. . . . .	500 . . . lines
Maximum Circuit Value:		
Grid-No.1-Circuit Resistance	. . . . .	1.6 max. megohms

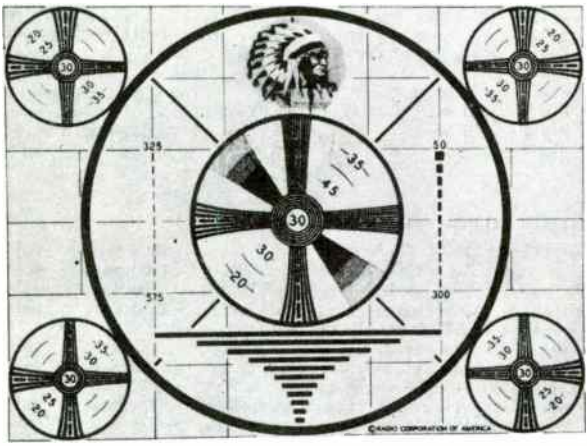
▲ Individual tubes may require between + 20% and − 20% of these values.

‡ 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.

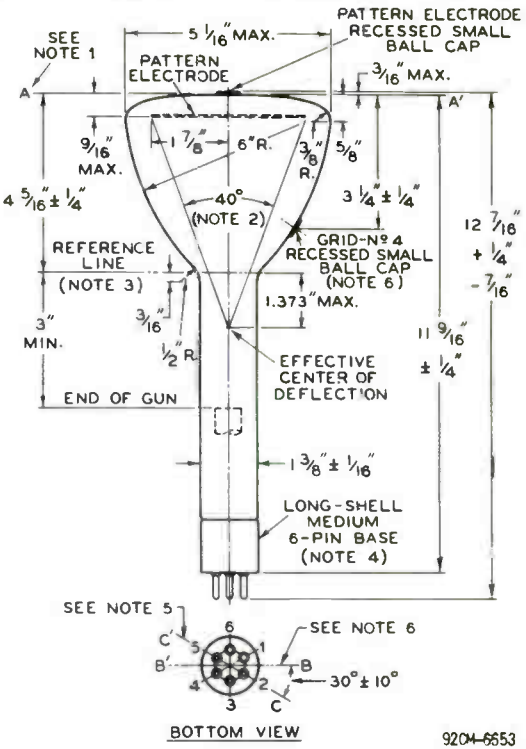
▲▲ With full scanning.

PATTERN



92CS-6665

2F21
MONOSCOPE



BOTTOM VIEW

9204-6653

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

NOTE 4: ℄ OF BULB WILL NOT DEVIATE MORE THAN 2° 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.

3API-A
OSCILLOGRAPH TUBE

GENERAL DATA
except for those on the phosphor as indicated below,
MAXIMUM RATINGS, TYPICAL OPERATION, OUTLINE,
and
AVERAGE CHARACTERISTICS CURVES
(Anode-No.2 & Grid-No.2 Microamperes vs Grid-No.1 Volts)
for the 3API-A
are the same as those for Type 908-A.

Phosphor (For Curves, see front of this Section)	No.1
Fluorescence	Green
Persistence	Medium

Oscillograph Tube

ELECTROSTATIC FOCUS — ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to all other electrodes	7.5	μμf
Cathode to all other electrodes	4.3	μμf
Deflecting electrode DJ_1 to deflecting electrode DJ_2	5.2	μμf
Deflecting electrode DJ_3 to deflecting electrode DJ_4	7	μμf
DJ_1 to all other electrodes	10.1	μμf
DJ_2 to all other electrodes	7.5	μμf
DJ_3 to all other electrodes	8.1	μμf
DJ_4 to all other electrodes	9.2	μμf
Faceplate, Spherical	Clear Glass	
Phosphor (For Curves, see front of this Section)	P1	
Fluorescence	Yellowish-Green	
Phosphorescence	Yellowish-Green	
Persistence	Medium	
Focusing Method	Electrostatic	
Deflection Method	Electrostatic	
Overall Length	9-1/8" ± 1/4"	
Greatest Diameter of Bulb	3" ± 1/16"	
Minimum Useful Screen Diameter	2-3/4"	
Useful Scan (Centered with respect to tube face):		
By deflecting electrodes DJ_1 & DJ_2	2-3/4"	
By deflecting electrodes DJ_3 & DJ_4	2-1/4"	
Operating Position	Any	
Bulb	J24P1	
Base. Small-Shell Duodecal 12-Pin (JEDEC Group 4, No.B12-43)		
Basing Designation for BOTTOM VIEW	12E	

Pin 1 – Heater
Pin 2 – Grid No.1
Pin 3 – Cathode
Pin 4 – Grid No.3
Pin 5 – Internal Connection—Do Not Use
Pin 6 – Deflecting Electrode DJ_3
Pin 7 – Deflecting Electrode DJ_4

Pin 8 – Ultor (Grid No.2, Grid No.4, Collector)
Pin 9 – Deflecting Electrode DJ_2
Pin 10 – Deflecting Electrode DJ_1
Pin 11 – Internal Connection—Do Not Use
Pin 12 – Heater

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

3AQP1

Maximum and Minimum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	2750 max. 500 min.	volts volts
ULTOR INPUT (AVERAGE)	6 max.	watts
GRID-No.3 VOLTAGE	1100 max.	volts
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 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 (E_{c_4}) between 500 and 2750 volts

Grid-No.3 Voltage for focus	16.5% to 31% of E_{c_4}	volts
Negative Grid-No.1 Voltage for visual extinction of undeflected spot	2.8% to 6.7% of E_{c_4}	volts
Grid-No.3 Current for any operating condition	-15 to +10	μa
Deflection Factors:		
DJ_1 & DJ_2	73 to 99	v dc/in./kv of E_{c_4}
DJ_3 & DJ_4	26 to 35	v dc/in./kv of E_{c_4}

RCA

3BP1-A

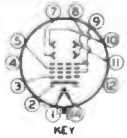
HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 3BP1

General:

Heater, for Unipotential Cathode:		
Voltage	6.3 ± 10%	ac or dc volts
Current	0.6	amp.
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to All Other Electrodes	8.5	μμf
Cathode to All Other Electrodes	8.0	μμf
DJ_1 to DJ_2	2.0	μμf
DJ_3 to DJ_4	2.0	μμf
DJ_1 to All Other Electrodes	8.0	μμf
DJ_3 to All Other Electrodes	6.0	μμf
DJ_1 to All Other Electrodes except DJ_2	6.0	μμf
DJ_2 to All Other Electrodes except DJ_1	5.0	μμf
DJ_3 to All Other Electrodes except DJ_4	4.0	μμf
DJ_4 to All Other Electrodes except DJ_3	6.0	μμf
Phosphor (For Curves, see front of this Section)		No.1
Fluorescence		Green
Persistence		Medium
Focusing Method		Electrostatic
Deflection Method		Electrostatic
Overall Length		10" ± 1/4"
Greatest Diameter of Bulb		3" ± 1/16"
Minimum Useful Screen Diameter		2-3/4"
Mounting Position		Any
Base		Medium Shell Diheptal 12-Pin
Basing Designation for BOTTOM VIEW		14G

Pin 1 – Heater
Pin 2 – Cathode
Pin 3 – Grid No.1
Pin 4 – Internal Con. Do Not Use
Pin 5 – Anode No.1
Pin 7 – Deflecting Electrode DJ_3
Pin 8 – Deflecting Electrode DJ_4



Pin 9 – Anode No.2, Grid No.2
Pin 10 – Deflecting Electrode DJ_2
Pin 11 – Deflecting Electrode DJ_1
Pin 12 – No Conn.
Pin 14 – Heater

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 is deflected toward pin 5. With DJ_3 positive with respect to DJ_4 the spot is deflected toward pin 2.

The angle between the trace produced by DJ_1 and DJ_2 and its intersection with the plane through the tube axis and pin 5 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° ± 3°.

Maximum Ratings, *Abolute Values*:

ANODE-No.2 & GRID-No.2 VOLTAGE	2200 *max.*	volts
ANODE-No.1 VOLTAGE	1100 *max.*	volts

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

3BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:			
Negative Value.		200 max.	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		125 max.	volts
Heater positive with respect to cathode		10 max.	volts

Typical Operation:

Anode-No.2 & Grid-No.2 Voltage■	1500	2000	volts
Anode No.1 Voltage for Focus at 75% of Grid-No.1 Voltage for Cutoff●	430	575	volts
Grid-No.1 Volt. for Visual Cutoff#	−45	−60	volts
Max. Anode-No.1 Current Range▲	Between −50 and +10		μamp.
Deflection Sensitivity:			
DJ_1 and DJ_2	0.169	0.127	mm/v dc
DJ_3 and DJ_4	0.229	0.172	mm/v dc
Deflection Factor:**			
DJ_1 and DJ_2	150	200	v dc/in.
DJ_3 and DJ_4	111	148	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 +20% and −30% 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_1 and DJ_2. Suitable test conditions are: anode-No.2 voltage, 1500 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 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.

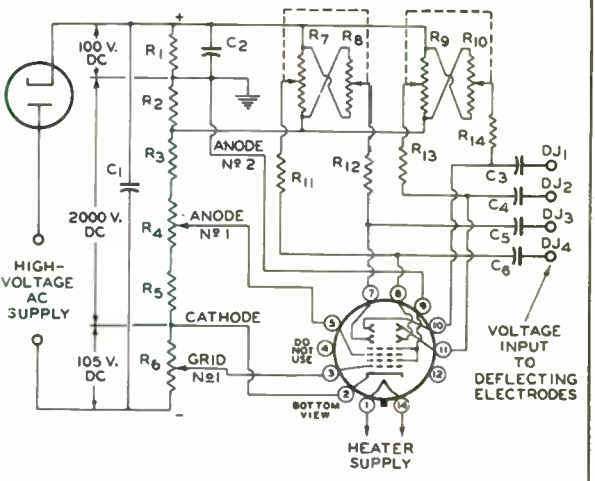
Grid-No.1-Circuit Resistance	1.5 max.	megohms
Impedance of Any Deflecting-Electrode Circuit at Heater-Supply Frequency	1.0 max.	megohm
Resistance in Any Deflecting-Electrode Circuit▲▲	5.0 max.	megohms

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

3BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



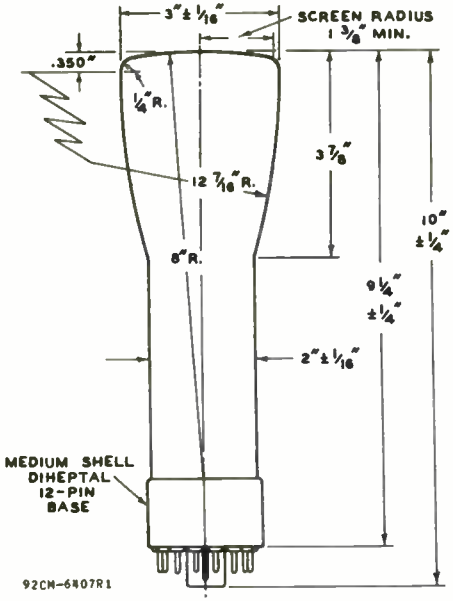
92CS-6514

C1: 0.1 μf
C2: 1.0 μf
C3 C4 C5 C6: 0.05-μf Blocking Capacitors*
R1 R2: 2 Megohms
R3: 5.5 Megohms
R4: 2-Megohm Potentiometer
R5: 1.5 Megohms
R6: 0.5-Megohm Potentiometer
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-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.

3BP1-A

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

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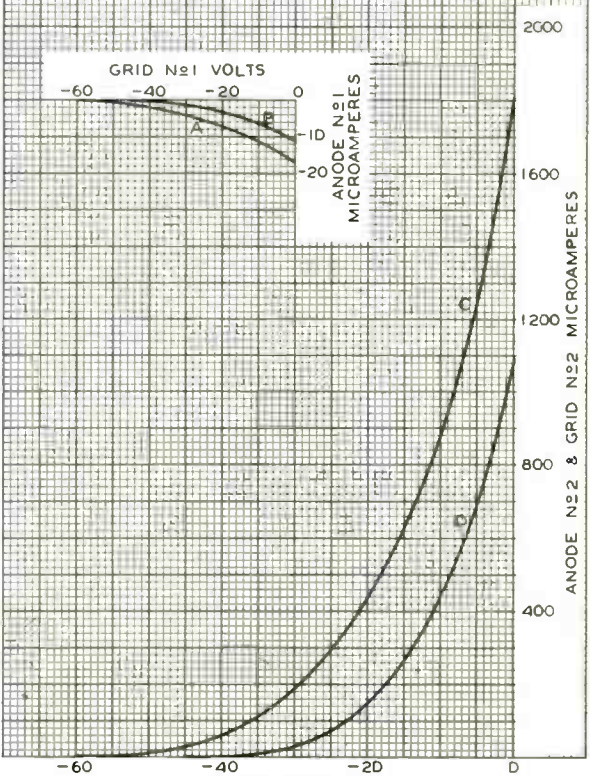
3BP1-A

AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS
ANODE №1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE №2 & GRID №2 VOLTS
A	ANODE №1	2000
B	ANODE №1	1500
C	ANODE №2 & GRID №2	2000
D	ANODE №2 & GRID №2	1500



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RCA

3JP1

OSCILLOGRAPH TUBE

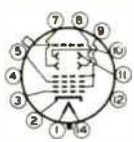
POST-DEFLECTION ACCELERATOR
ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to All Other Electrodes	8	μμf
Cathode to All Other Electrodes	8	μμf
DJ_1 to DJ_2	2.5	μμf
DJ_3 to DJ_4	2	μμf
DJ_1 to All Other Electrodes	8	μμf
DJ_2 to All Other Electrodes	7	μμf
DJ_3 to All Other Electrodes	7	μμf
DJ_4 to All Other Electrodes	8	μμf
Phosphor (For Curves, see front of this Section)		P1
Fluorescence and Phosphorescence		Green
Persistence of Phosphorescence		Medium
Focusing Method		Electrostatic
Deflection Method		Electrostatic
Overall Length		10" ± 1/4"
Greatest Diameter of Bulb		3" ± 1/16"
Minimum Useful Screen Diameter		2-3/4"
Mounting Position		Any
Cap	Recessed Small Ball (JETEC No.J1-22)	
Base	Medium-Shell Diheptal 12-Pin (JETEC No.B12-37)	
Basing Designation for BOTTOM VIEW		$14J_1$

Pin 1 – Heater
Pin 2 – Cathode
Pin 3 – Grid No.1
Pin 4 – Internal Connection – Do Not Use
Pin 5 – Anode No.1
Pin 7 – Deflecting Electrode DJ_3
Pin 8 – Deflecting Electrode DJ_4
Pin 9 – Anode No.2, Grid No.2
Pin 10 – Deflecting Electrode DJ_2
Pin 11 – Deflecting Electrode DJ_1
Pin 12 – No Connection
Pin 14 – Heater
Cap – Anode No.3



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 is deflected toward pin 5. With DJ_3 positive with respect to DJ_4, 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_1 and DJ_2 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 $DJ_1 - DJ_2$ trace and $DJ_3 - DJ_4$ trace is 90° ± 3°.

3JP1

3JP1
OSCILLOGRAPH TUBE

Maximum Ratings, *Design-Center Values:*

ANODE-No.3 VOLTAGE	4000 max.	volts
ANODE-No.2□ VOLTAGE	2000 max.	volts
RATIO OF ANODE-No.3 VOLTAGE TO ANODE-No.2 VOLTAGE	2.3 : 1 max.	
ANODE-No.1 VOLTAGE	1000 max.	volts
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 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_3) between 2000 and 4000 volts and any anode-No.2 voltage (Eb_2) between 1500** and 2000 volts*

Anode-No.1 Voltage	20% to 34.5% of Eb_2	volts
Grid-No.1 Voltage†	1.5% to 4.5% of Eb_2	volts
Anode-No.1 Current for any Operating Condition	−50 to +10	μamp
Deflection Factors:		
When Eb_3 = 2 x Eb_2		
DJ_1 & DJ_2	85 to 115	v dc/in./kv of Eb_2
DJ_3 & DJ_4	62.5 to 85	v dc/in./kv of Eb_2
When Eb_3 = Eb_2		
DJ_1 & DJ_2	68 to 92	v dc/in./kv of Eb_2
DJ_3 & DJ_4	50 to 68	v dc/in./kv of Eb_2
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 be not 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 3 000 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 tube shielded from all extraneous fields, 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_1 and DJ_2.

†: See next page.

RCA

3JP1

OSCILLOGRAPH TUBE

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.	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:				
DJ_1 & DJ_2. . . .	136 to 184	127 to 173	170 to 230	■
DJ_3 & DJ_4. . . .	100 to 136	94 to 128	125 to 170	■

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max. megohms
Resistance in Any Deflecting-Electrode Circuit▲. . . .	5.0 max. megohms

† For visual extinction of undeflected focused spot.

■ volts dc/in.

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

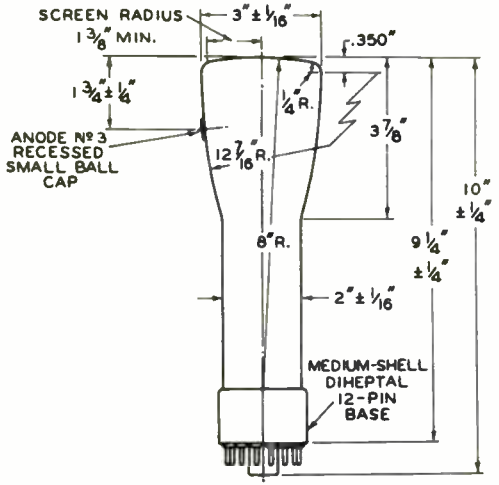
OPERATING NOTES

The 3JP1 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 3JP1 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 3JP1 can be operated with scanning frequencies as low as 20 cycles per second without excessive flicker.

3JP1
OSCILLOGRAPH TUBE



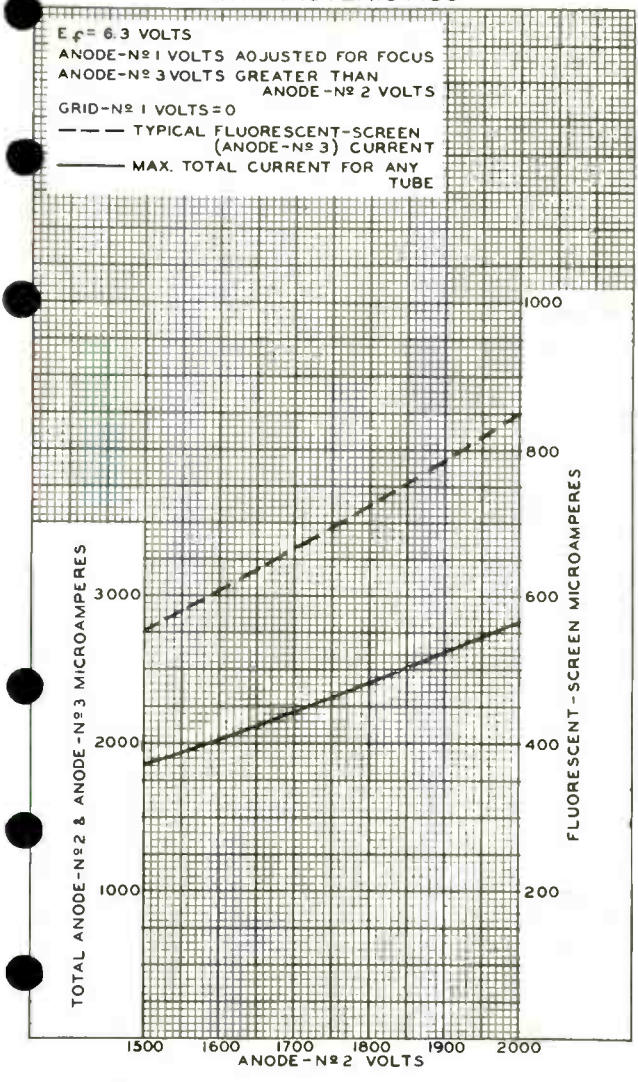
℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF BASE.

92CM-6583

RCA

3JP1

CHARACTERISTICS



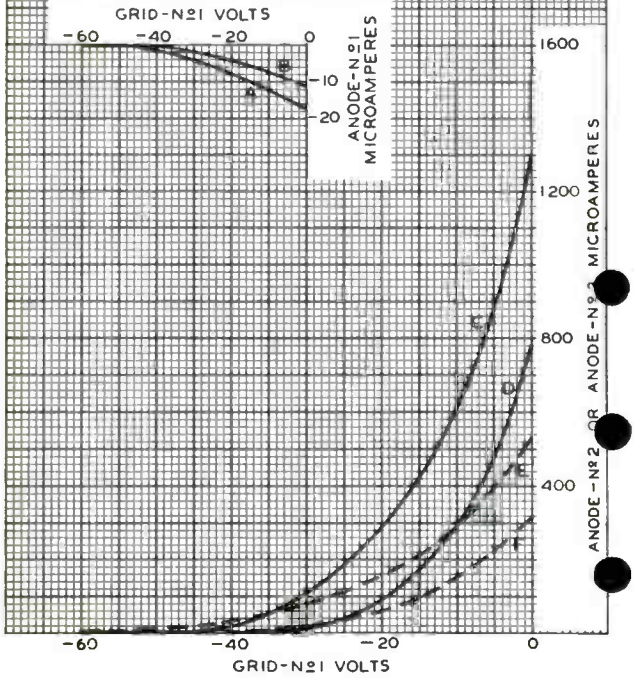
3JP1

AVERAGE CHARACTERISTICS

E_f = 6.3 VOLTS

ANODE-№1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE-№2 VOLTS	ANODE-№3 VOLTS
A	ANODE №1	2000	4000
B	ANODE №1	1500	3000
C	ANODE №2	2000	4000
D	ANODE №2	1500	3000
E	ANODE №3	2000	4000
F	ANODE №3	1500	3000



RCA

3JP7

OSCILLOGRAPH TUBE

POST-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 4000 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 DJ_1 and DJ_2.

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

RCA

3KP1

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS — ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp ←
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to all other electrodes	8	μμf
Deflecting electrode DJ_1 to deflecting electrode DJ_2	2.5	μμf
Deflecting electrode DJ_3 to deflecting electrode DJ_4	2.5	μμf
DJ_1 to all other electrodes	11	μμf
DJ_2 to all other electrodes	8	μμf
DJ_3 to all other electrodes	7	μμf
DJ_4 to all other electrodes	8	μμf
Faceplate	Clear Glass	←
Phosphor (For Curves, see front of this Section)	P1	
Fluorescence	Green	
Phosphorescence	Green	←
Persistence	Medium	
Focusing Method	Electrostatic	
Deflection Method	Electrostatic	
Overall Length	11-1/2" ± 1/4"	
Greatest Diameter of Bulb	3" ± 1/16"	
Minimum Useful Screen Diameter	2-3/4"	
Weight (Approx.)	9 oz	←
Mounting Position	Any	
Bulb	J-24	←
Base	Medium-Shell Magnal 11-Pin (JETEC No.B11-66)	←
Basing Designation for BOTTOM VIEW	11M	

Pin 1 – Heater
Pin 2 – Grid No.1
Pin 3 – Cathode
Pin 4 – Grid No.3
Pin 5 – Deflecting Electrode DJ_3
Pin 6 – Deflecting Electrode DJ_4
Pin 7 – Ultor (Grid No.2, Grid No.4, Collector)
Pin 8 – Deflecting Electrode DJ_2
Pin 9 – Deflecting Electrode DJ_1
Pin 10 – Internal Connection–Do Not Use
Pin 11 – Heater

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

← Indicates a change.

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RCA

3KP1

OSCILLOGRAPH TUBE

With DJ_1 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 1.

The plane through the tube axis and pin 1 may vary from the trace produced by DJ_3 and DJ_4 by ±10° (measured about the tube axis).

The angle between $DJ_1 - DJ_2$ trace and $DJ_3 - DJ_4$ trace is 90° ±3°.

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	2500 max.	volts
→ ULTOR INPUT (AVERAGE)	6 max.	watts
GRID-No.3 VOLTAGE	1000 max.	volts
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 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 ultor voltage (E_{c_4}) between recommended minimum and 2500 volts*

Grid-No.3 Voltage for Focus	16% to 30% of E_{c_4}	volts
→ Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	1.9% to 4.5% of E_{c_4}	volts
Grid-No.3 Current for Any Operating Condition	−15 to +10	μamp
Deflection Factors:		
DJ_1 & DJ_2	50 to 68	v dc/in./kv of E_{c_4}
DJ_3 & DJ_4	38 to 52	v dc/in./kv of E_{c_4}
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 3KP1 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.

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.

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3KP1

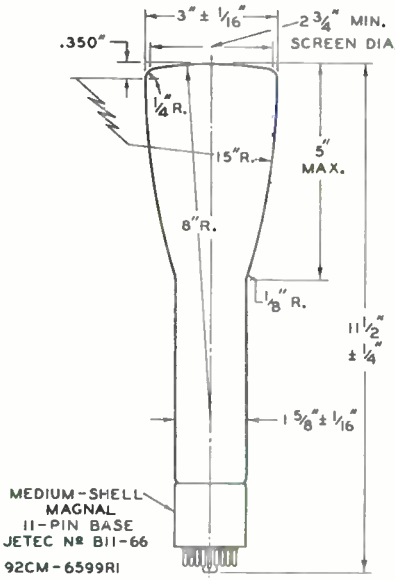
OSCILLOGRAPH TUBE

For ultor voltage of	*1000*	*2000*	*volts*
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-19 to -45	-38 to -90	volts ←
Deflection Factors:			
DJ_1 & DJ_2	50 to 68	100 to 136	volts dc/in.
DJ_3 & DJ_4	38 to 52	76 to 104	volts dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting Electrode Circuit■	5 max.	megohms

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

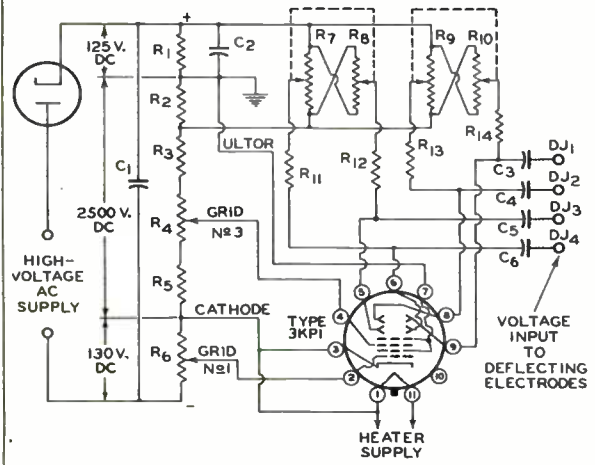


℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

← indicates a change.

3KP1
OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



92CS-6690R2

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

R4: 2-Megohm Potentiometer, 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

R11 R12 R13 R14: 2 Megohms, 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.

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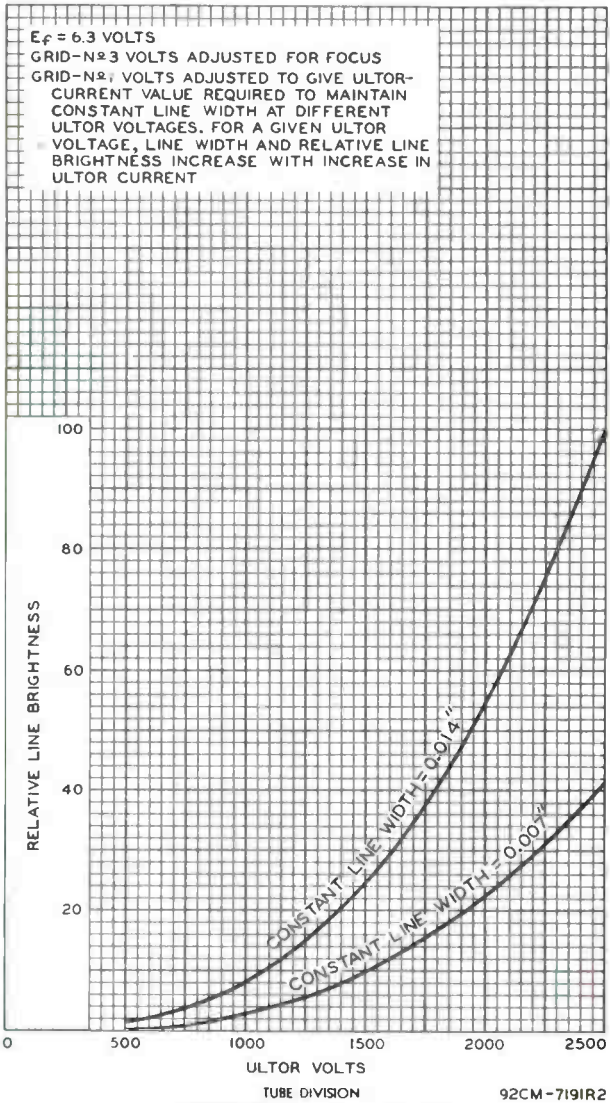
3KP1

CHARACTERISTICS



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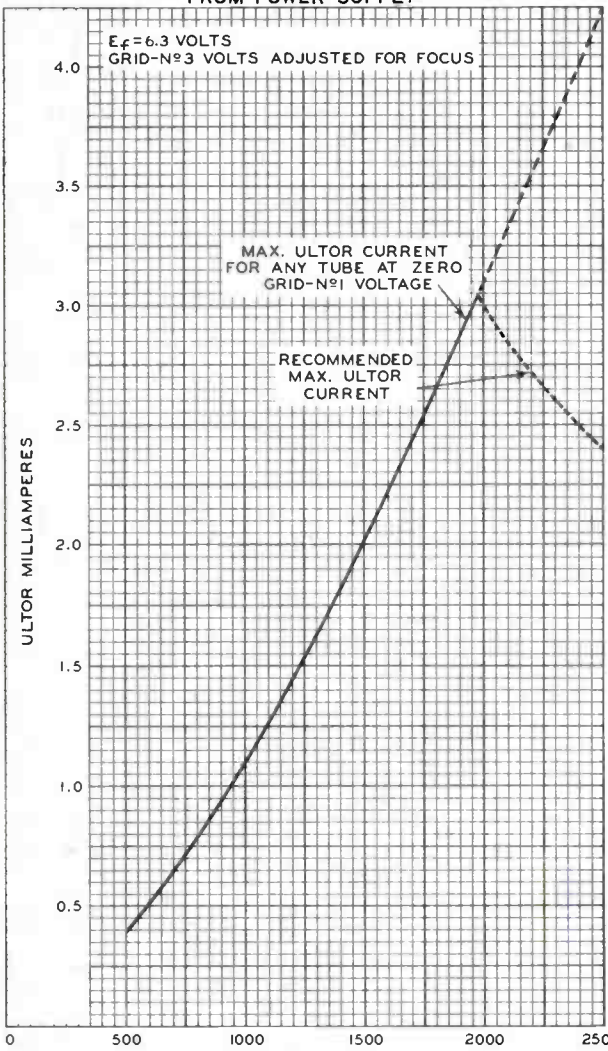
92CM-7191R2

RCA

3KP1

MAXIMUM ULTOR-CURRENT REQUIREMENTS FROM POWER SUPPLY



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92CM-7192R1

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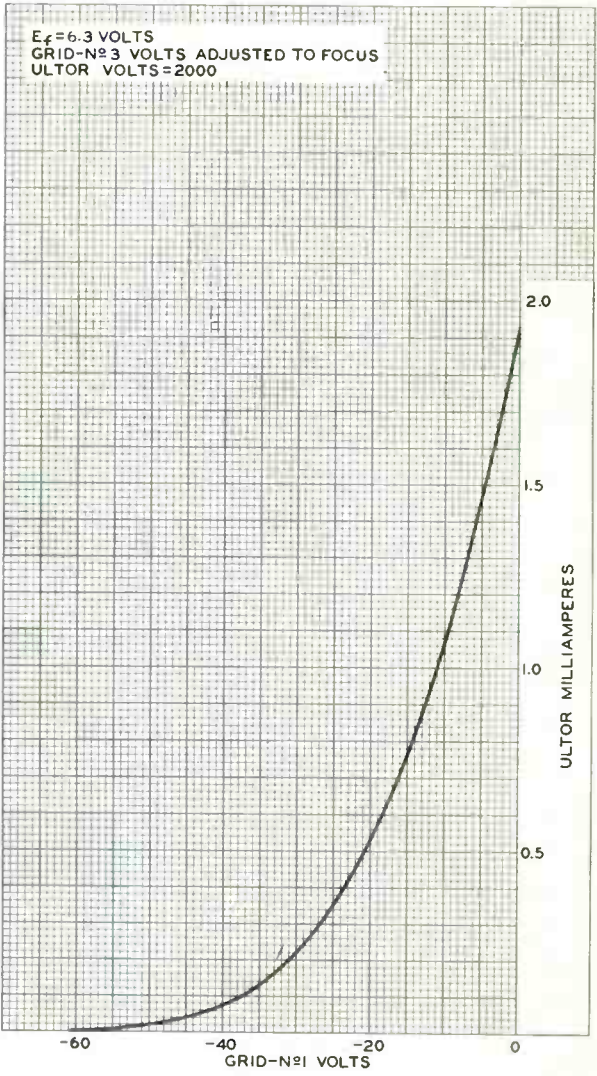
3KP1

AVERAGE CHARACTERISTIC



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92CM-6658R2

RCA

3KP4

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

The 3KP4 is the same as the 3KP1 except for the following items:

General:

Phosphor (For curves, see front of this Section). . P4—Sulfide Type
Fluorescence. . . . . White
Phosphorescence . . . . . White
Persistence . . . . . Medium-Short ←

In general, operation of the 3KP4 at an ultor voltage less than 1500 volts is not recommended.

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

3KP7

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

The 3KP7 is the same as the 3KP1 except for the following items:

General:

Phosphor (For Curves, see front of this Section). P7
Fluorescence. . . . . Purplish-Blue ←
Persistence . . . . . Medium-Short ←
Phosphorescence . . . . . Yellowish-Green ←
Persistence . . . . . Very Long ←

In general, operation of the 3KP7 at an ultor voltage less than 1500 volts is not recommended.

3KP11

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

The 3KP11 is the same as the 3KP1 except for the following items:

General:

Phosphor (For Curves, see front of this Section). P11
Fluorescence. . . . . Blue
Phosphorescence . . . . . Blue
Persistence . . . . . Medium-Short ←

In general, operation of the 3KP11 at an ultor voltage less than 1500 volts is not recommended.

← Indicates a change.

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3KP16
OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

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

General:

Phosphor (For Curves, see front of this Section) P16
Fluorescence—
Visible radiation. . . . . Violet
Invisible radiation. . . . . Near-Ultraviolet
Phosphorescence—
Persistence of visible radiation . . . . . Very Short
Persistence of invisible radiation . . . . . Very Short

In general, operation of the 3KP16 at an ultor voltage less than 1500 volts is not recommended.

3RP1

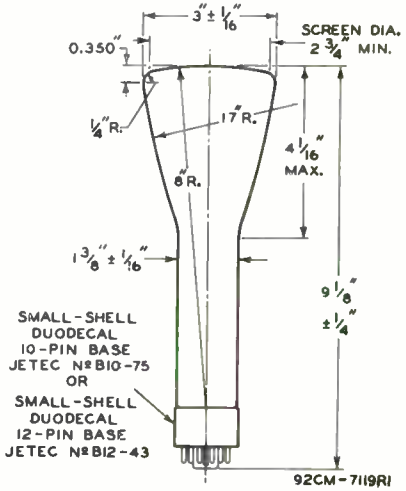
OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

The 3RP1 is the same as the 3RP1-A except for the following items:

General:

Faceplate	Spherical Clear Glass
Bulb	J-24P1
Weight (Approx.)	7 oz



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

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3RP1-A

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to all other electrodes	8	μμf
Deflecting electrode DJ_1 to deflecting electrode DJ_2	2	μμf
Deflecting electrode DJ_3 to deflecting electrode DJ_4	2	μμf
DJ_1 to all other electrodes	11	μμf
DJ_2 to all other electrodes	8	μμf
DJ_3 to all other electrodes	7	μμf
DJ_4 to all other electrodes	8	μμf
Faceplate	Flat Clear Glass	
Phosphor (For Curves, see front of this Section)	P1	
Fluorescence	Green	
Phosphorescence	Green	
Persistence	Medium	
Focusing Method	Electrostatic	
Deflection Method	Electrostatic	
Overall Length	9-1/8" ± 1/4"	
Greatest Diameter of Bulb	3" ± 1/16"	
Minimum Useful Screen Diameter	2-3/4"	
Mounting Position	Any	
Weight (Approx.)	12 oz	
Bulb	J-24S1	
Base	Small-Shell Duodecal 10-Pin (JETEC No.B10-75), or Small-Shell Duodecal 12-Pin (JETEC No.B12-43)	
Basing Designation for BOTTOM VIEW	12E	

Pin 1 – Heater
Pin 2 – Grid No.1
Pin 3 – Cathode
Pin 4 – Grid No.3
Pin 5▲– Internal Connection– Do Not Use
Pin 6 – Deflecting Electrode DJ_3
Pin 7 – Deflecting Electrode DJ_4

Pin 8 – Ultor (Grid No.2, Grid No.4, Collector)
Pin 9 – Deflecting Electrode DJ_2
Pin 10 – Deflecting Electrode DJ_1
Pin 11▲– Internal Connection– Do Not Use
Pin 12 – Heater

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

▲ Pins 5 and 11 are omitted from the 10-pin base.

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3RP1-A

OSCILLOGRAPH TUBE

With DJ_1 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 1.

The plane through the tube axis and pin 1 may vary from the trace produced by DJ_3 and DJ_4 by 10° (measured about the tube axis).

The angle between DJ_1 – DJ_2 trace and DJ_3 – DJ_4 trace is 90° ± 3°.

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

ULTOR° VOLTAGE	2500 max.	volts
ULTOR INPUT (AVERAGE)	6 max.	watts
GRID-No.3 VOLTAGE	1000 max.	volts
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 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 ultor voltage (E_{c_4}) between 500 and 2500 volts*

Grid-No.3 Voltage for Focus	16.5% to 31% of E_{c4}	volts
Maximum Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	−6.75% of E_{c4}	volts
Grid-No.3 Current for Any Operating Condition	−15 to +10	μamp
Deflection Factor:		
DJ_1 & DJ_2	73 to 99	v dc/in./kv of E_{c4}
DJ_3 & DJ_4	52 to 70	v dc/in./kv of E_{c4}
Spot Position	##	

° 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 3RP1-A, the ultor function is performed by grid No.4. Since grid No.4, grid No.2, and collector are connected together within the 3RP1-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 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.

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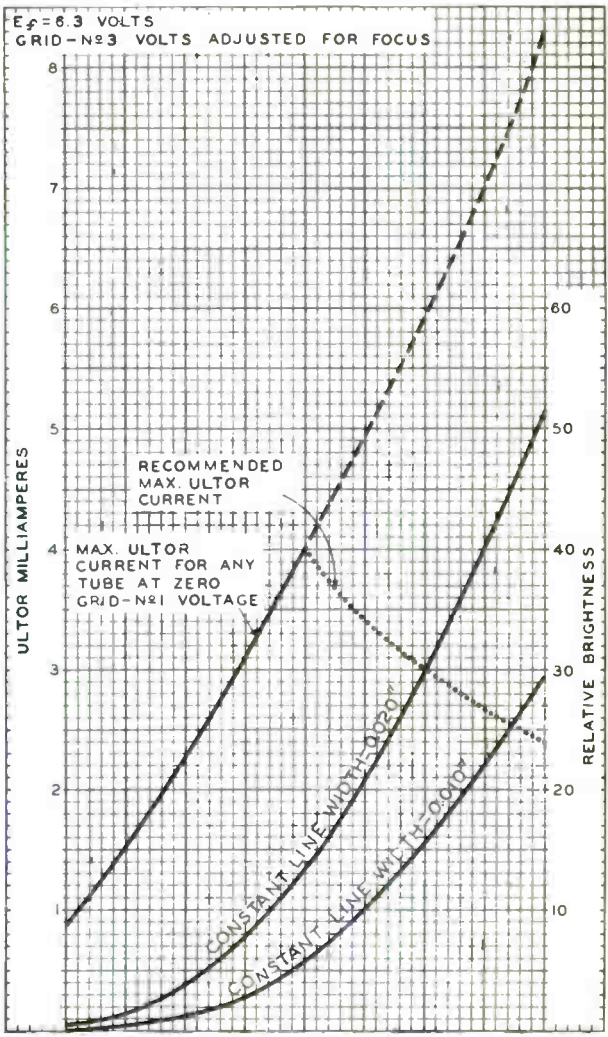
3RP1-A
CHARACTERISTICS



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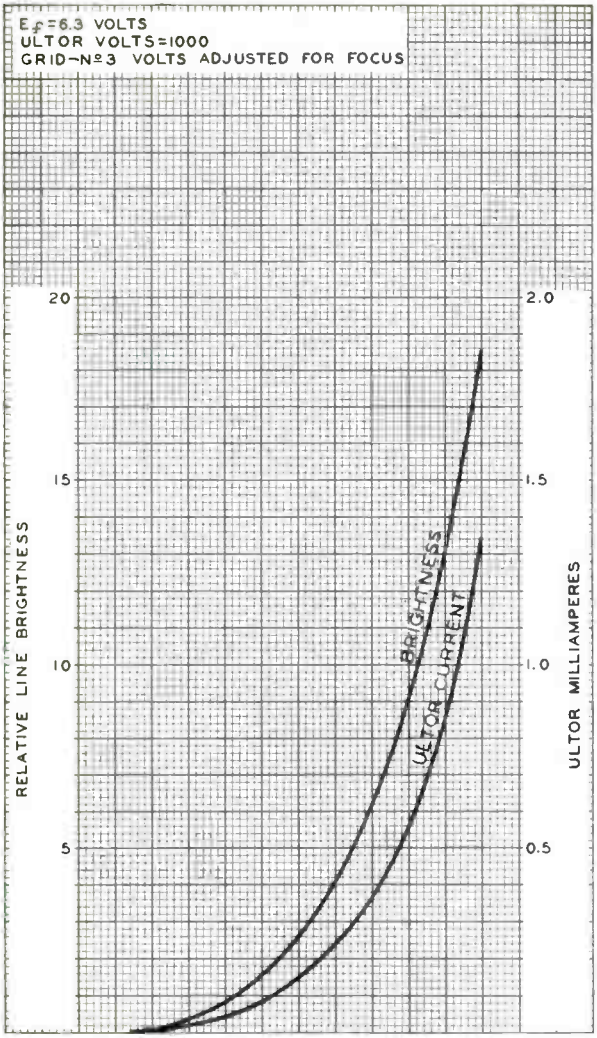
3RP1-A

AVERAGE CHARACTERISTICS



3WP1

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS — ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	4.6 to 8.7	μμf
Cathode to all other electrodes	3 to 5.7	μμf
Deflecting electrode DJ_1 to deflecting electrode DJ_2	1.7 to 3.3	μμf
Deflecting electrode DJ_3 to deflecting electrode DJ_4	1 to 2	μμf
DJ_1 to all other electrodes	5.5 to 10.5	μμf
DJ_2 to all other electrodes	5.5 to 10.5	μμf
DJ_3 to all other electrodes	3.5 to 6.8	μμf
DJ_4 to all other electrodes	3.5 to 6.8	μμf
Faceplate, Flat		Clear Glass
Phosphor (For Curves, see front of this Section)		P1
Fluorescence		Green
Phosphorescence		Green
Persistence		Medium
Focusing Method		Electrostatic
Deflection Method		Electrostatic
Deflecting-electrode arrangement		*See Dimensional Outline*
Overall Length		11-1/2" ± 1/8"
Greatest Diameter of Bulb		3" ± 1/16"
Minimum Useful Screen Diameter		2-3/4"
Minimum Useful Scan (Centered with respect to tube face):		
By deflecting electrodes DJ_1 & DJ_2		2-1/2"
By deflecting electrodes DJ_3 & DJ_4		2-1/4"
Weight (Approx.)		1 lb
Mounting Position		Any
Bulb		J24R
Base	Small-Shell Duodecal 10-Pin (JETEC No.B10-75), or Small-Shell Duodecal 12-Pin (JETEC No.B12-43)	
Basing Designation for BOTTOM VIEW		12T

Pin 1 – Heater
Pin 2 – Grid No.1
Pin 3 – Cathode
Pin 4 – Grid No.3
Pin 6 – Deflecting Electrode DJ_1
Pin 7 – Deflecting Electrode DJ_2

Pin 8 – Ultor (Grid No.2, Grid No.4, Collector)
Pin 9 – Deflecting Electrode DJ_4
Pin 10 – Deflecting Electrode DJ_3
Pin 12 – Heater

RCA

3WP1

OSCILLOGRAPH TUBE

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	2500 max.	volts
ULTOR INPUT (AVERAGE)	6 max.	watts
GRID-No.3 VOLTAGE	1000 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	200 max.	volts
Positive bias value	0 max.	volts
Positive peak value	0 max.	volts
PEAK VOLTAGE BETWEEN ULTOR AND ANY DEFLECTING ELECTRODE	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Equipment Design Ranges:

For any ultor voltage (E_{c_4}) between recommended minimum and 2500 volts*

Grid-No.3 Voltage for Focus	16.5% to 31% of E_{c_4}	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-3% to -5% of E_{c_4}	volts
Grid-No.3 Current for Any Operating Condition	-15 to +10	μa
Deflection Factors:		
DJ_1 & DJ_2	41.5 to 50.5	v dc/in./kv of E_{c_4}
DJ_3 & DJ_4	28.5 to 35	v dc/in./kv of E_{c_4}
Spot Position	##	

Examples of Use of Design Ranges:

For ultor voltage of	*1000*	*1500*	*2000*	*volts*
Grid-No.3 Voltage for Focus	165 to 310	247 to 465	330 to 620	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-30 to -50	-45 to -75	-60 to -100	volts
Deflection Factors:				
DJ_1 & DJ_2	41.5 to 50.5	62.3 to 75.8	83 to 101	v dc/in.
DJ_3 & DJ_4	28.5 to 35	42.8 to 52.5	57 to 70	v dc/in.

* Brilliance and definition decrease with decreasing ultor voltage. Recommended minimum for the 3WP1 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.

##: See next page.

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3WP1

OSCILLOGRAPH TUBE

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting-Electrode Circuit■	5 max.	megohms

SPECIAL PERFORMANCE DATA

For ultor voltage of 1500 volts

Line Width▲	0.026 max.	inch
Peak Grid-No.1 Drive from Spot Cutoff▲	50 max.	volts
Raster Shape	§	
Deflection Factor Uniformity	♦	

With grid-No.1 voltage adjusted to give a spot that is just visible, and the tube shielded from all extraneous fields, the center of the undeflected focused spot will fall within a circle of 3/16-inch radius concentric with the center of the tube face.

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

▲ Under the following conditions: heater voltage of 6.3 volts, brightness of 7 foot-lamberts measured on a 2" x 2", 49-line raster with high-frequency scanning applied to deflecting electrodes DJ_1 and DJ_2. For *line-width measurement*, the high-frequency scanning is adjusted to give a raster width of 6.9 cm with the grid-No.3 voltage adjusted to give 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 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 centered with respect to the tube face and size adjusted to give mean dimensions of 1.875" in 1DJ2 direction and 1.688" in 3DJ4 direction, all points on the raster will lie within the area between the two rectangles also centered with respect to the tube face; the one, 1.920" in 1DJ2 direction by 1.730" in 3DJ4 direction; the other, 1.830" in 1DJ2 direction and 1.646" in 3DJ4 direction.

♦ The deflection factor for either DJ_1 and DJ_2 electrodes or DJ_3 and DJ_4 electrodes for a deflection of less than 75 per cent of the respective useful scan will not differ from the deflection factor for the corresponding deflecting electrodes at 25 per cent of the useful scan by more than 2 per cent.

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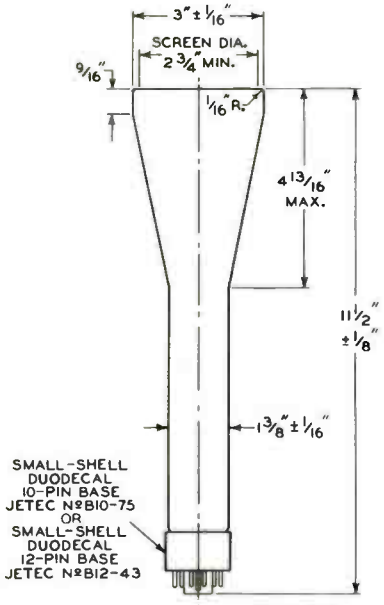
3WP1

OSCILLOGRAPH TUBE



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

THE PLANE THROUGH THE TUBE AXIS AND PIN 3 MAY VARY FROM THE TRACE PRODUCED BY DJ_1 AND DJ_2 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° ± 1°.

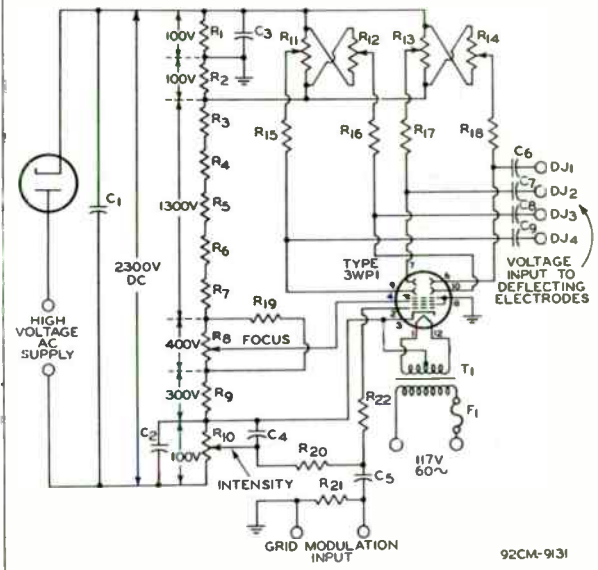
DJ_1 AND DJ_2 ARE NEARER THE SCREEN: DJ_3 AND DJ_4 ARE NEARER THE BASE. WITH DJ_1 POSITIVE WITH RESPECT TO DJ_2, THE SPOT WILL BE DEFLECTED TOWARD PIN 3: LIKEWISE, WITH DJ_3 POSITIVE WITH RESPECT TO DJ_4, THE SPOT WILL BE DEFLECTED TOWARD PIN 12.

RCA

3WP1

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.5 μf, 3000 volts

C2: 8 μf, 250 volts

C3: 1 μf, 200 volts

C4: 1 μf, 200 volts

C5: 0.05 μf, 3000 volts

C6 C7 C8 C9: 0.05 μf, 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

R10: 100000-ohm potentiometer, 1/2 watt

R11 R12: Dual 1-megohm potentiometer, 1/2 watt

R13 R14: Dual 1-megohm potentiometer, 1/2 watt

R15 R16 R17 R18: 1.5 megohms, 1/2 watt

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 T26F45.

F1: 1-ampere fuse

RCA

3WPI

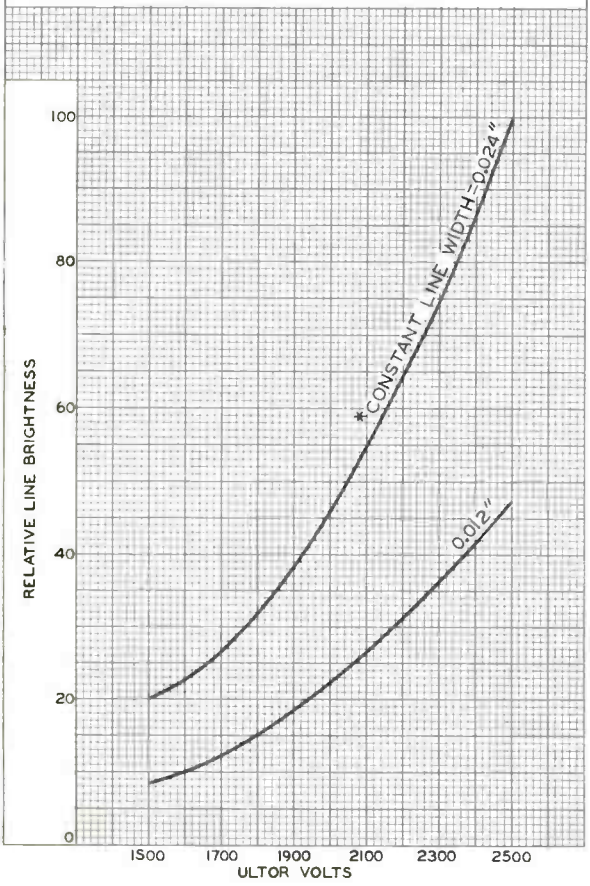
AVERAGE CHARACTERISTICS

E_f = 6.3 VOLTS

GRID-No.3 VOLTS ADJUSTED FOR FOCUS.

GRID-No.1 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.

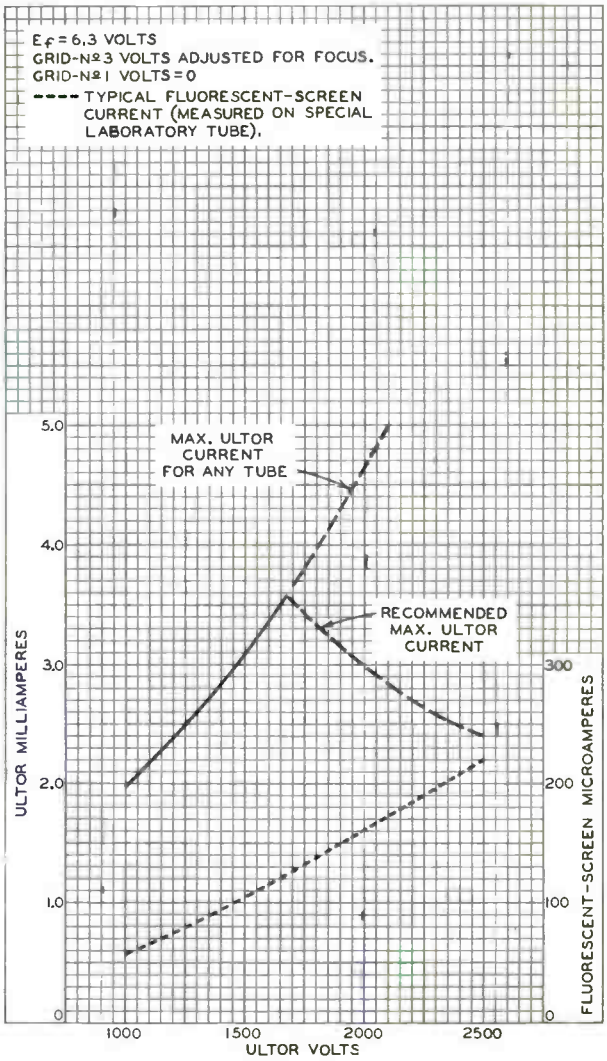
* LINE WIDTH MEASURED BETWEEN POINTS WHERE BRIGHTNESS WAS APPROX. 1/2 THAT AT CENTER OF LINE.



RCA

3WP1

CHARACTERISTICS



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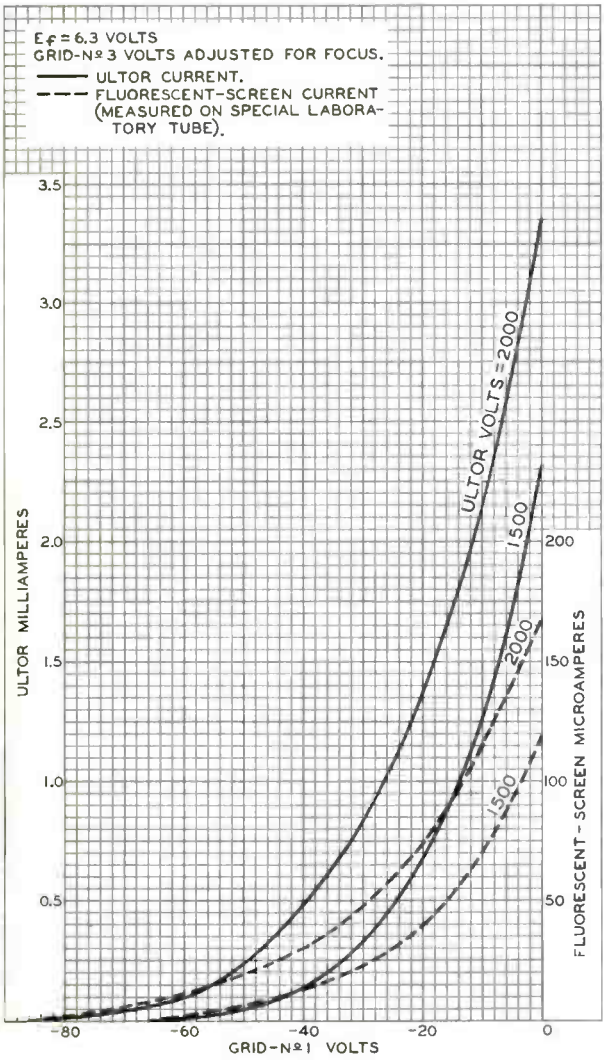
RCA

3WPI

AVERAGE CHARACTERISTICS



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3WP2
OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

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

General:

Phosohor (For Curves, see front of this Section). P2
Fluorescence. . . . . Greenish-Yellow
Phosphorescence . . . . . Greenish-Yellow
Persistence . . . . . .Long

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.

3WP11
OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

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

General:

Phosphor (For Curves, see front of this Section). P11
Fluorescence. . . . . .Blue
Phosphorescence . . . . . .Blue
Persistence . . . . . Short

Line widtn 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.

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OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

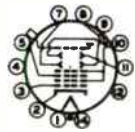
DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to All Other Electrodes	8	μμf
Cathode to All Other Electrodes	5	μμf
DJ_1 to DJ_2	2.5	μμf
DJ_3 to DJ_4	1.3	μμf
DJ_1 to All Other Electrodes	9	μμf
DJ_2 to All Other Electrodes	9	μμf
DJ_3 to All Other Electrodes	5	μμf
DJ_4 to All Other Electrodes	6	μμf
Faceplate, Flat		Clear Glass
Phosphor (For Curves, see front of this Section)		P1
Fluorescence and Phosphorescence		Green
Persistence of Phosphorescence		Medium
Focusing Method		Electrostatic
Deflection Method		Electrostatic
Overall Length		16-3/4" ± 3/8"
Greatest Diameter of Bulb		5-1/4" ± 3/32"
Minimum Useful Screen Diameter		4-9/16"
Bulb		J42
Weight (Approx.)		2-1/2 lbs
Mounting Position		Any
Cap	Recessed Small Ball (JETEC No.J1-22)	
Base	Medium-Shell Diheptal 12-Pin (JETEC No.B12-37)	

BOTTOM VIEW

Pin 1 - Heater
Pin 2 - Cathode
Pin 3 - Grid No.1
Pin 4 - No Connection - Do Not Use
Pin 5 - Grid No.3
Pin 7 - Deflecting Electrode DJ_3
Pin 8 - Deflecting Electrode DJ_4



Pin 9 - Ultor (Grid No.2, Grid No.4)
Pin 10 - Deflecting Electrode DJ_2
Pin 11 - Deflecting Electrode DJ_1
Pin 12 - No. Conn.
Pin 14 - Heater
Cap - Post-Ultor (Grid No.5, Collector)

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 is deflected toward pin 5. With DJ_3 positive with respect to DJ_4, 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_1 and DJ_2 by

5ABP1
OSCILLOGRAPH TUBE

the following angular tolerances (measured about the tube axis): Pin 5, 10°; side terminal (on same side of tube as pin 5), 10°. Angle between $DJ_1 - DJ_2$ trace and $DJ_3 - DJ_4$ trace is 90° ± 1.5°.

Maximum Ratings, *Design-Center Values:*

POST-ULTOR● VOLTAGE	6000 max.	volts
ULTOR▲ VOLTAGE	2600 max.	volts
RATIO OF POST-ULTOR VOLTAGE TO ULTOR VOLTAGE	2.3:1 max.	
GRID-No.3 VOLTAGE	1000 max.	volts
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 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 post-ultor voltage (E_{c_5}) between 2000 and 6000 volts and any ultor voltage (E_{c_4}) between 1500** and 2600 volts*

Grid-No.3 Voltage for Focus	20% to 34.5% of E_{c_4}	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	2.6% to 4.3% of E_{c_4}	volts
Grid-No.3 Current for Any Operating Condition	−15 to +10	μamp

Deflection Factors:#

When $E_{c_5} = 2 \times E_{c_4}$

DJ_1 & DJ_2	26.5 to 36	v dc/in./kvof E_{c_4}
DJ_3 & DJ_4	18 to 24	v dc/in./kvof E_{c_4}

When $E_{c_5} = E_{c_4}$

DJ_1 & DJ_2	21.5 to 29	v dc/in./kvof E_{c_4}
DJ_3 & DJ_4	14.5 to 19.5	v dc/in./kvof E_{c_4}
Spot Position	##	

Examples of Use of Design Ranges:

For post-ultor voltage of	*2000*	*3000*	*4000*	*volts*
and ultor voltage of	*2000*	*1500*	*2000*	*volts*
Grid-No.3 Volt. for Focus	400 to 690	300 to 515	400 to 690	volts
Grid-No.1 Volt.□	−52 to −87	−39 to −65	−52 to −87	volts

●,▲,○,*,**,#,##,□: See next page.

RCA

5ABP1

OSCILLOGRAPH TUBE

Deflection Factors:#

DJ_1 & DJ_2	43 to 58	40 to 54	53 to 72	v dc/in.
DJ_3 & DJ_4	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 "post-ultor".

▲ 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 5AB-types, the ultor function is performed by grid No.4. Since grid No.4 and grid No.2 are connected together within the 5AB-types, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

○ 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 DJ_3 and DJ_4 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 4 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-megohm 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.

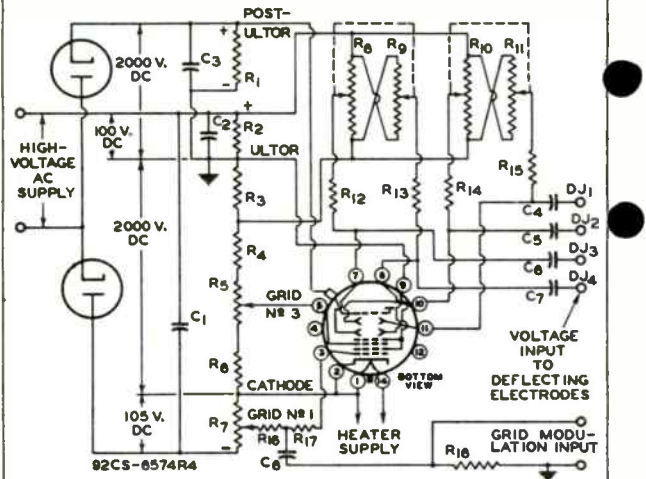
■ It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

5ABP1

5ABP1

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



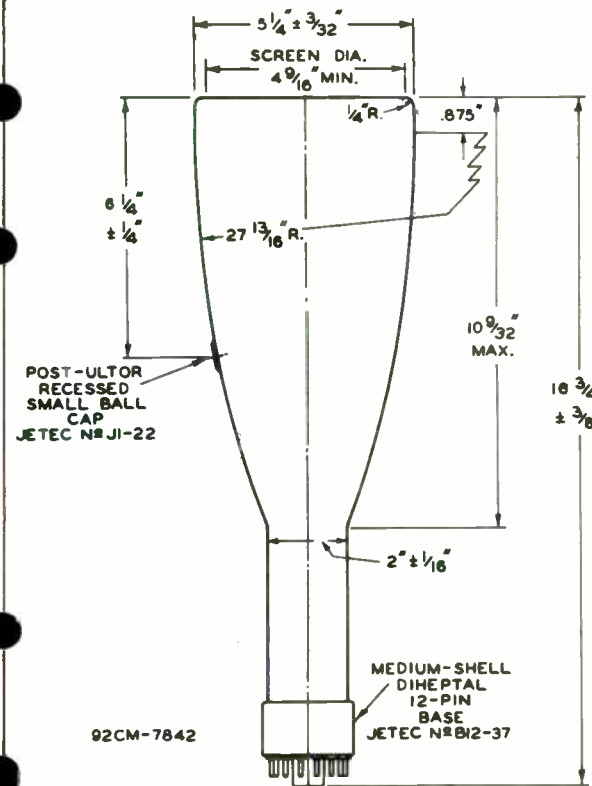
C1: 0.1 μf, 2500 Volts
C2: 1.0 μf, 200 Volts
C3: 0.1 μf, 2500 Volts
C4 C5 C6 C7: 0.05-μf, Blocking Capacitors*
C8: 0.0001 μf, 2500 Volts
R1: 50 Megohms (Five 10-Megohm, 1-Watt Resistors in Series)
R2 R3: 2 Megohms, 0.5 Watt
R4: 5.5 Megohms, 2 Watts
R5: 2-Megohm Potentiometer
R6: 1.5 Megohms, 0.5 Watt
R7: 0.5-Megohm Potentiometer
R8 R9: 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 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.

RCA

5ABP1

OSCILLOGRAPH TUBE

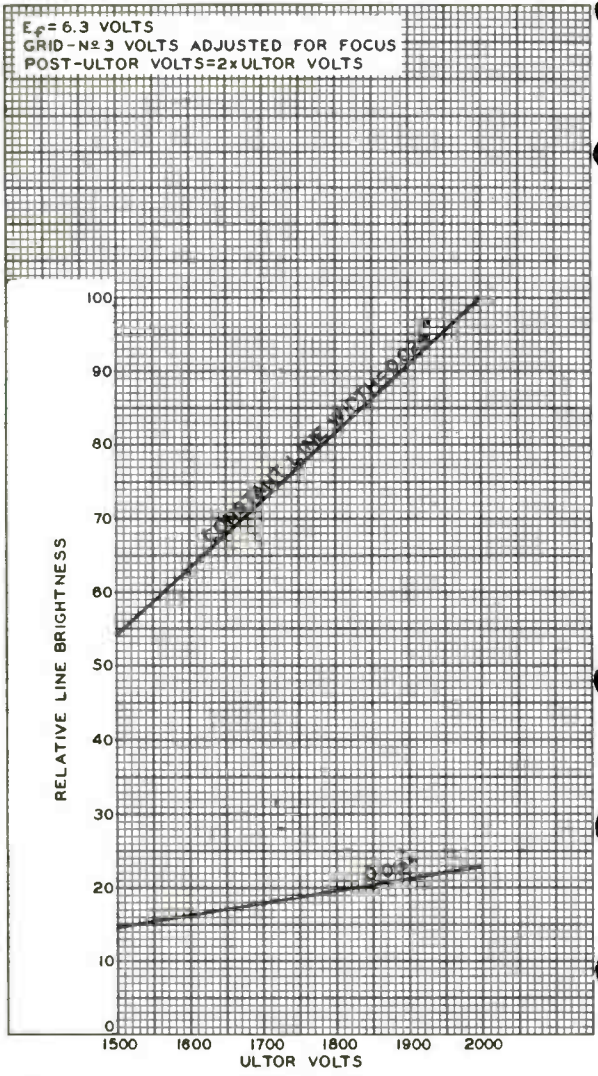


℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE

RCA

5ABP1

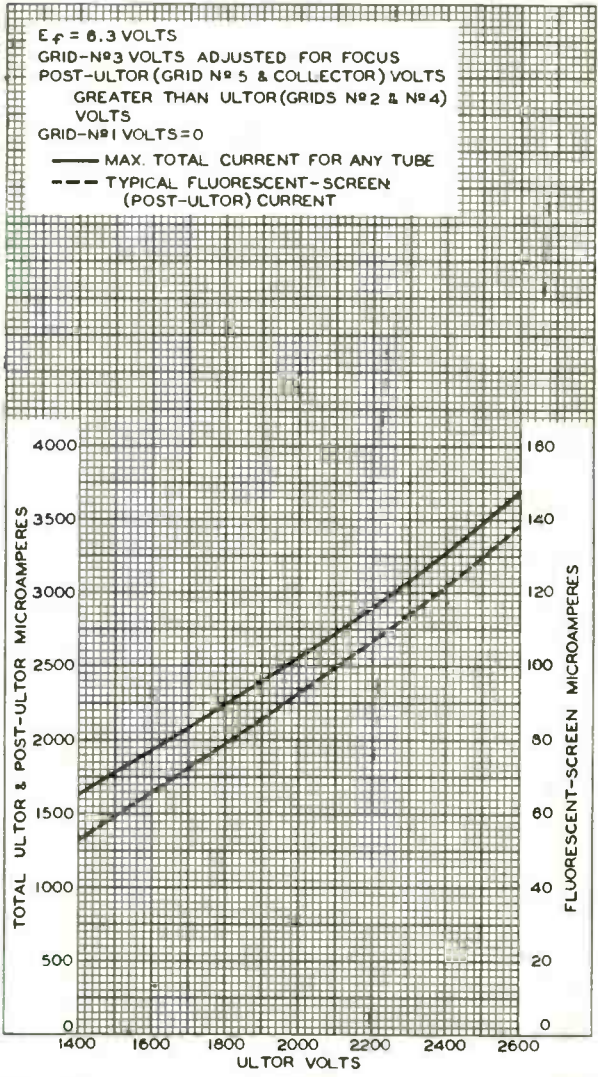
TYPICAL CHARACTERISTICS



RCA

5ABP1

CHARACTERISTICS



FEB. 3, 1953

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7910

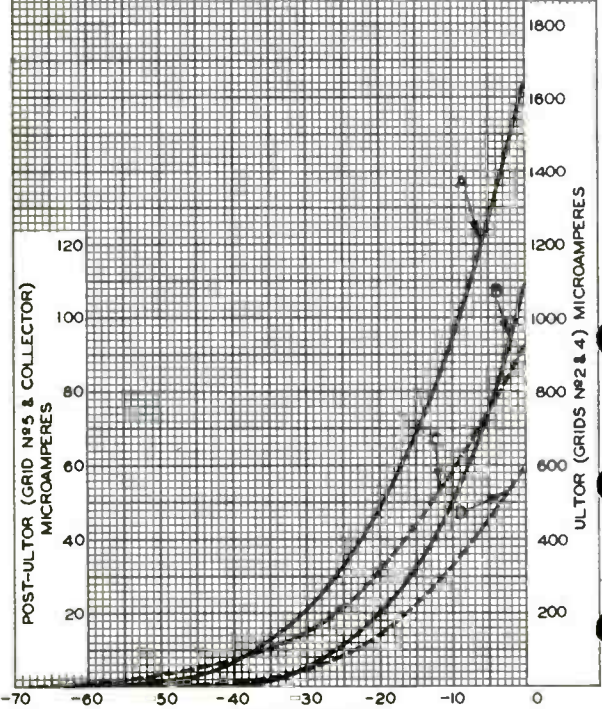
RCA

5ABP1

AVERAGE CHARACTERISTICS

E_f = 6.3 VOLTS
GRID-№3 VOLTS ADJUSTED FOR FOCUS

CURVE	ELECTRODE CURRENT	ULTOR VOLTS	POST-ULTOR VOLTS
A	ULTOR	2000	4000
B	ULTOR	1500	3000
C	POST-ULTOR	2000	4000
D	POST-ULTOR	1500	3000



FEB. 4, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7911

5ABP4
OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR
ELECTROSTATIC FOCUS — ELECTROSTATIC DEFLECTION

The 5ABP4 is the same as the 5ABP1 except for the following items:

General:

Phosphor (For curves, see front of this section)	P4—Sulfide Type
Fluorescence	White
Phosphorescence	White
Persistence	Short

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
ELECTROSTATIC FOCUS — ELECTROSTATIC DEFLECTION

The 5ABP7 is the same as the 5ABP1 except for the following items:

General:

Phosphor (For Curves, see front of this Section)	P7
Fluorescence	Blue
Persistence	Short
Phosphorescence	Greenish-Yellow
Persistence	Long

5ABP11
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 Curves, see front of this Section)	P11
Fluorescence	Blue
Phosphorescence	Blue
Persistence	Short

5AUP24

COLOR FLYING-SPOT CATHODE-RAY TUBE

HIGH-RESOLUTION CAPABILITY — ALUMINIZED SCREEN
ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

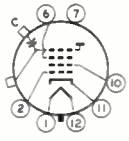
For use as flying-spot scanner in color video-signal generators

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp ←
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	8	μμf
Cathode to all other electrodes	5	μμf
External conductive neck coating to ultor	500 max. 100 min.	μμf μμf
Faceplate, Flat		Clear Glass
Phosphor		P24 Aluminized ←
Fluorescence		Green ←
Phosphorescence		Green ←
Persistence		Short ←
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angle (Approx.)		40°
Overall Length		12-1/2" ± 3/8"
Greatest Diameter		5" ± 1/8"
Minimum Useful Screen Diameter		4-1/4"
Operating Position		Any
Weight (Approx.)		1.4 lbs
Cap		Recessed Small Cavity (JETEC No.J1-21)
Socket		*See Operating Considerations*
Base		Small-Shell Duodecal 7-Pin (JETEC Group 4, No.B7-51) ←
Basing Designation for BOTTOM VIEW		12C ←

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	6000 max.	volts
GRID-No.2 VOLTAGE	350 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	150 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

← Indicates a change.

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5AUP24

COLOR FLYING-SPOT CATHODE-RAY 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	150 max.	volts
→ Heater positive with respect to cathode.	150 max.	volts

Characteristics Range Values for Equipment Design:

For any ultor voltage (E_{c_u}) between 20000● and 27000 volts		
Grid-No.3 Voltage for focus with ultor current of 200 μa .	17% to 21.5% of E_{c_4}	volts
Grid-No.2 Voltage when circuit design utilizes fixed grid-No.1 voltage (E_{c_1}) for visual extinction of undeflected focused spot	2 to 5 times E_{c_1}	volts
Grid-No.1 Voltage for visual extinction of undeflected focused spot when circuit design utilizes grid-No.2 voltage (E_{c_2}) at fixed value	20% to 50% of E_{c_2}	volts
Maximum Grid-No.3 Current for ultor current of 200 μa. . . .	170	μa
Grid-No.2 Current.	−15 to +15	μa

Examples of Use of Design Ranges:

For ultor voltage of	*27000*	*volts*
Grid-No.3 Voltage for focus with ultor current of 200 μa .	4600 to 5800	volts
Grid-No.2 Voltage when circuit design utilizes fixed grid-No.1 voltage of −70 volts for visual extinction of undeflected focused spot	140 to 350	volts
Grid-No.1 Voltage for visual extinction of undeflected focused spot when circuit design utilizes grid-No.2 voltage of 200 volts.	−40 to −100	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 20,000 volts.

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.

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

5AUP24

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 positions should be omitted in order to provide the maximum insulation for the high-voltage pins 6 and 7. The socket should be made of high-grade, arc-resistant, insulating material and should preferably be designed with baffles.

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 limiting 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 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.

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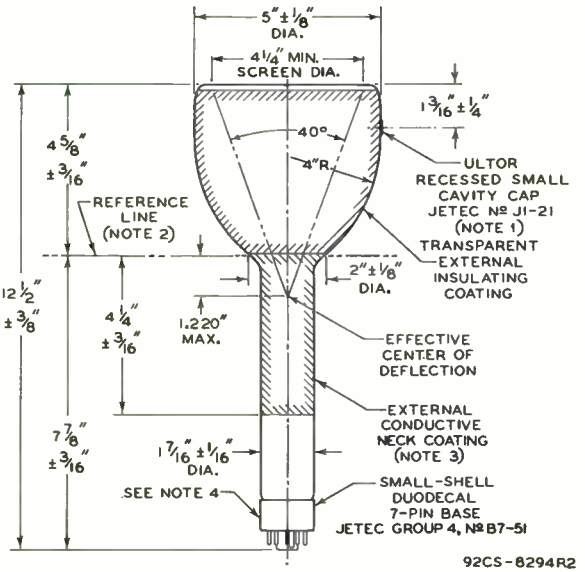
5AUP24

COLOR FLYING-SPOT CATHODE-RAY TUBE



NOTE 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 ± 10°. 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-110 (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.

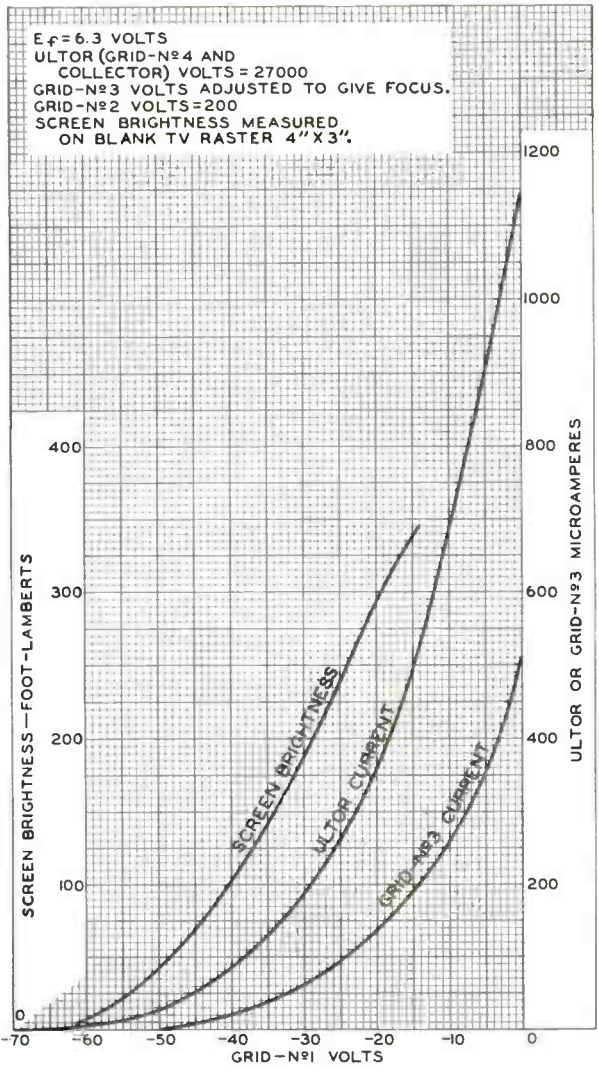
NOTE 3: EXTERNAL CONDUCTIVE NECK COATING MUST BE GROUNDED.

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

RCA

5AUP24

AVERAGE CHARACTERISTICS



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92CM-8343RI

RCA

5AZP4

PROJECTION KINESCOPE

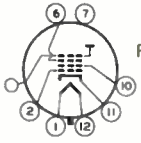
ALUMINIZED FLUORESCENT SCREEN
FORCED-AIR COOLED AT MAXIMUM ULTOR INPUT
ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	8 max.	μμf
Cathode to all other electrodes	5	μμf
Faceplate, Spherical	Non-browning Glass	
Refractive index	1.519	
Phosphor (For Curves, see front of this Section)	P4—Silicate Type Aluminized	
Fluorescence	White	
Phosphorescence	White	
Persistence	Medium	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angle (Approx.)	50°	
Overall Length	12-3/16" ± 3/8"	
Greatest Diameter of Bulb	5" ± 1/8"	
Minimum Useful Screen Diameter	4-1/2"	
Minimum Optical-Quality-Circle Diameter	4-1/4"	
Weight (Approx.)	1-1/2 lbs	
Mounting Position	Any	
Ultor Lead	Molded-On Insulated Cable 48" Long	
Bulb	J-40	
Base	Small-Shell Duodecal 7-Pin (JETEC No.B7-51)	
Basing Designation for BOTTOM VIEW	12AA	

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 – Ultor (Grid No.4, Collector)

NOTE: Socket contacts for vacant pin positions 3,4,5,8, and 9 should be removed so that maximum insulation is provided for pins 6 and 7.

Air Flow to Face (When average ultor input exceeds 9 watts):
An adequate air flow sufficient to limit the faceplate temperature to the specified value should be delivered perpendicularly from a nozzle having a diameter of about 2 inches onto the face of the tube when it is in operation. The blower should have adequate capacity to provide for a total system pressure drop including that of the air filter.

Face Temperature	100 max.	°C

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5AZP4

PROJECTION KINESCOPE

Maximum Ratings, *Absolute Values:*

ULTOR VOLTAGE	40000 max.	volts
ULTOR INPUT (AVERAGE):		
Without forced-air cooling of faceplate	9 max.	watts
With forced-air cooling of faceplate	12 max.	watts
GRID-No.3 VOLTAGE	9000 max.	volts
GRID-No.2 VOLTAGE	400 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	150 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	175 max.	volts
Heater positive with respect to cathode	10 max.	volts

Equipment Design Ranges:

For any ultor voltage (E_{c_4}) between 35000 and 40000 volts*

Grid-No.3 (Focusing Electrode) Voltage for ultor current of 300 μamp	18.5% to 22.5% of E_{c_4}	volts
Grid-No.2 Voltage when circuit design utilizes grid-No.1 voltage (E_{c_1}) at fixed value for raster cutoff	2.15 to 5.4 times E_{c_1}	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2 voltage (E_{c_2}) at fixed value	-18.5% to -46.5% of E_{c_2}	volts
Maximum Grid-No.3 Current for ultor current of 300 μamp	100	μamp
Grid-No.2 Current	-15 to +15	μamp

Examples of Use of Design Ranges:

For ultor voltage of 36000 volts

Grid-No.3 (Focusing Electrode) Voltage for ultor current of 300 μamp	6650 to 8100	volts
Grid-No.2 Voltage when circuit design utilizes grid-No.1 voltage of -65 volts for raster cutoff	140 to 350	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2 voltage of 200 volts	-37 to -93	volts

*: See next page.

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5AZP4

PROJECTION KINESCOPE

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 35000 volts.

OPERATING CONSIDERATIONS

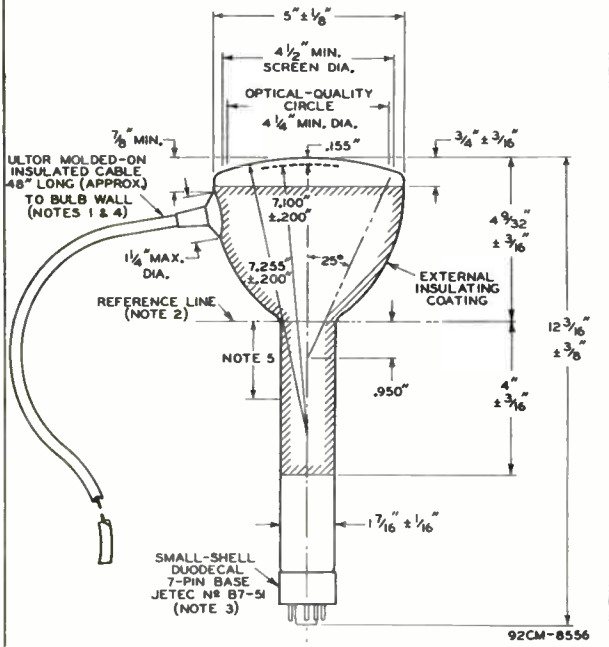
X-ray radiation is produced at the face of the 5AZP4 when it is operated at its normal ultor voltage. These rays can constitute a health hazard unless the tube is adequately shielded. For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section.

An *air-cooling system* is required to cool the face of the 5AZP4 when the tube is operated with an average ultor input in excess of 9 watts. The system consists of a suitable blower and 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 ultor power supply to prevent operation of the tube without cooling.

RCA

5AZP4

PROJECTION KINESCOPE



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5AZP4

PROJECTION KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR-CABLE CONNECTION AT BULB WALL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 20°. ULTOR-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: ULTOR 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.

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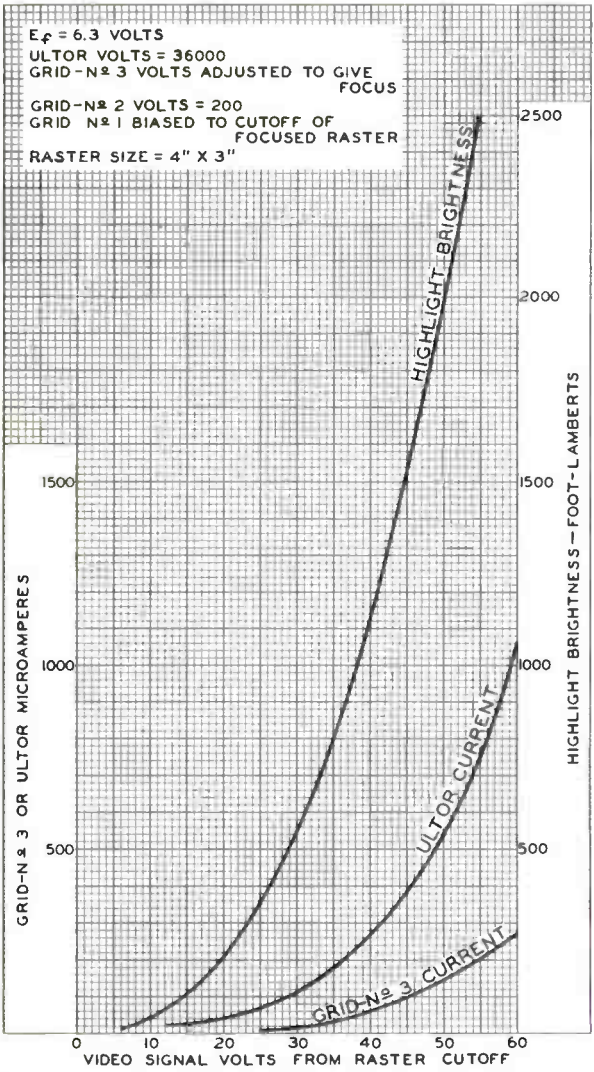
5AZP4

AVERAGE DRIVE CHARACTERISTICS



5BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 5BP1

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ± 10% ac or dc volts
Current	0.6 amp.
Direct Interelectrode Capacitances (Approx.):	
Grid No.1 to All Other Electrodes	8.0 µµf
DJ_1 to DJ_2	1.3 µµf
DJ_3 to DJ_4	1.2 µµf
DJ_1 to All Other Electrodes	9.5 µµf
DJ_2 to All Other Electrodes	12.0 µµf
DJ_1 to All Other Electrodes except DJ_2	8.0 µµf
DJ_2 to All Other Electrodes except DJ_1	7.5 µµf
DJ3 to All Other Electrodes except DJ4	10.0 µµf
DJ4 to All Other Electrodes except DJ3	7.5 µµf
Phosphor (For Curves, see front of this Section)	No.1
Fluorescence	Green
Persistence	Medium
Focusing Method	Electrostatic
Deflection Method	Electrostatic
Overall Length	16-3/4" ± 3/8"
Greatest Diameter of Bulb	5-1/4" + 1/16" − 3/32"
Minimum Useful Screen Diameter	4-1/2"
Mounting Position	Any
Base	Medium Shell Magnal 11-Pin
Basing Designation for BOTTOM VIEW	11N

Pin 1 – Heater
Pin 2 – No Connection
Pin 3 – Deflecting Electrode DJ1
Pin 4 – Anode No.1
Pin 5 – Internal Con. Do not use
Pin 6 – Deflecting Electrode DJ4

Pin 7 – Anode No.2, Grid No.2
Pin 8 – Deflecting Electr. DJ2
Pin 9 – Deflecting Electr. DJ3
Pin 10 – Grid No.1
Pin 11 – Heater, Cathode

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 is deflected toward pin 4. With DJ_3 positive with respect to DJ_4, the spot is deflected toward pin 1.

The angle between the trace produced by DJ_3 and DJ_4 and its intersection with the plane through the tube axis and pin 1 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° ± 3°.

5BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

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
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE	550 *max.*	volts

Typical 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
Grid-No.1 Volt. for Visual Cutoff#.	-30	-40	volts
Max. Anode-No.1 Current Range▲.	Between -50 and +10		μamp.
Deflection Sensitivity:			
DJ_1 and DJ_2	0.404	0.303	mm/v dc
DJ_3 and DJ_4	0.446	0.334	mm/v dc
Deflection Factor:**			
DJ_1 and DJ_2	63	84	v dc/in.
DJ_3 and DJ_4	57	76	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.

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 ± 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_1 and DJ_2. Suitable test conditions are: anode-No.2 voltage, 1500 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 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

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

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5CP1-A

OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR
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.):

Grid No.1 to All Other Electrodes	8	μμf
Cathode to All Other Electrodes	9	μμf
DJ_1 to DJ_2	2	μμf
DJ_3 to DJ_4	2	μμf
DJ_1 to All Other Electrodes	9	μμf
DJ_2 to All Other Electrodes	9	μμf
DJ_3 to All Other Electrodes	7	μμf
DJ_4 to All Other Electrodes	8	μμf

Phosphor (For Curves, see front of this Section)	P1
Fluorescence and Phosphorescence	Green
Persistence of Phosphorescence	Medium
Focusing Method	Electrostatic
Deflection Method	Electrostatic
Overall Length	16-3/4" ± 3/8"
Greatest Diameter of Bulb	5-1/4" ± 3/32"
Minimum Useful Screen Diameter	4-1/2"
Mounting Position	Any
Cap	Recessed Small Ball (JETEC No.A1-22)
Base	Medium-Shell Diheptal 12-Pin (JETEC No.B12-37)
Basing Designation for BOTTOM VIEW	$14J_1$

Pin 1 – Heater
Pin 2 – Cathode
Pin 3 – Grid No.1
Pin 4 – Internal Con. Do not use
Pin 5 – Anode No.1
Pin 7 – Deflecting Electrode DJ_3
Pin 8 – Deflecting Electrode DJ_4

Pin 9 – Anode No.2, Grid No.2
Pin 10 – Deflecting Electr. DJ_2
Pin 11 – Deflecting Electr. DJ_1
Pin 12 – No Connection
Pin 14 – Heater
Cap – Anode No.3

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 is deflected toward pin 5. With DJ_3 positive with respect to DJ_4, 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_1 and DJ_2 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 DJ_1 and DJ_2 and the trace produced by DJ_3 and DJ_4 is 90° ± 3°.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5CP1-A
OSCILLOGRAPH TUBE

Maximum Ratings, *Design-Center Values*:

ANODE-No.3 VOLTAGE	4000 max.	volts
ANODE-No.2* VOLTAGE	2000 max.	volts
RATIO OF ANODE-No.3 VOLTAGE TO ANODE-No.2 VOLTAGE	2.3 : 1	
ANODE-No.1 VOLTAGE	1000 max.	volts
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 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_3) between 2000** and 4000 volts and any anode-No.2 voltage (Eb_2) between 1500▲ and 2000 volts*

→ Anode-No.1 Voltage	18.7 to 34.5% of Eb_2	volts
→ Grid-No.1 Voltage◆	1.5% to 4.5% of Eb_2	volts
Anode-No.1 Current of any Operating Condition	−15 to +10	μamp

Deflection Factors:

When $Eb_3 = 2 \times Eb_2$

DJ_1 & DJ_2	39 to 53	v dc/in./kv of Eb_2
DJ_3 & DJ_4	33 to 45	v dc/in./kv of Eb_2

When $Eb_3 = Eb_2$

DJ_1 & DJ_2	31 to 42	v dc/in./kv of Eb_2
DJ_3 & DJ_4	27 to 37	v dc/in./kv of Eb_2
Spot Position	##	

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
→ Grid-No.1 Volt.◆	−30 to −90	−22.5 to −67.5	−30 to −90	volts
Deflection Factors:				
DJ_1 & DJ_2	62 to 84	59 to 80	78 to 106	□
DJ_3 & DJ_4	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

*, ●, **, ▲, ◆, ##, ■, □: See next page. → Indicates a change.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5CPI-A

OSCILLOGRAPH TUBE

* Anode No.2 and grid No.2, which are connected together within tube, are referrad 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 cutoff of undeflected focused spot.

□ Volts dc/in.

With heater voltage of 6.3 volts, anode-No.3 voltage of 4000 volts, anode-No.2 voltage of 2000 volts, anode-No.1 voltage adjusted to 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 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.

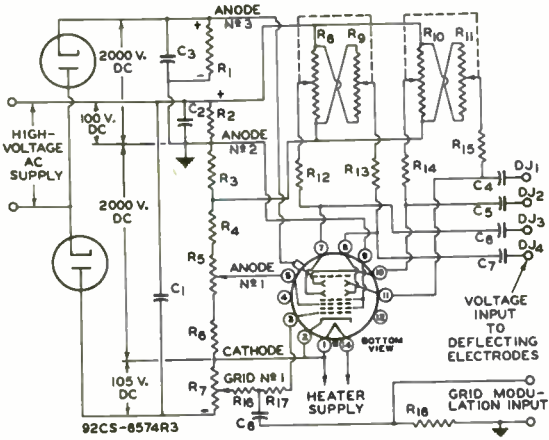
■ It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

5CP1-A

5CP1-A

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



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 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
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.

OCTOBER 1, 1951

CE-6574R3

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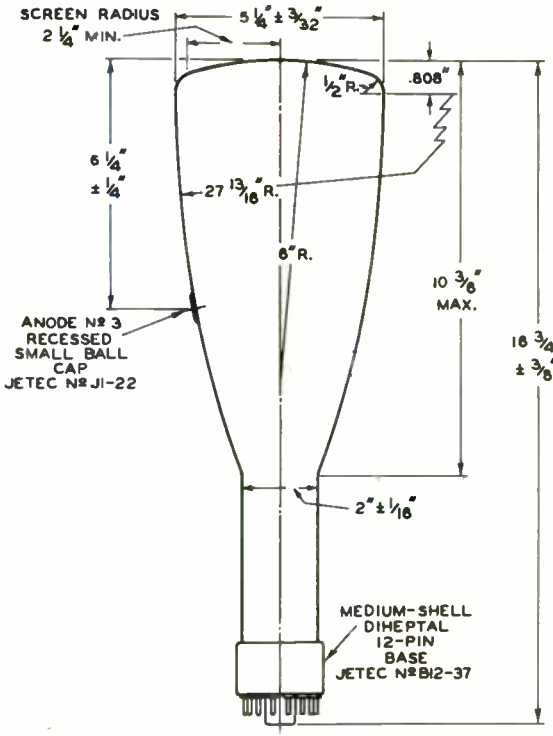
5CP1-A
OSCILLOGRAPH TUBE

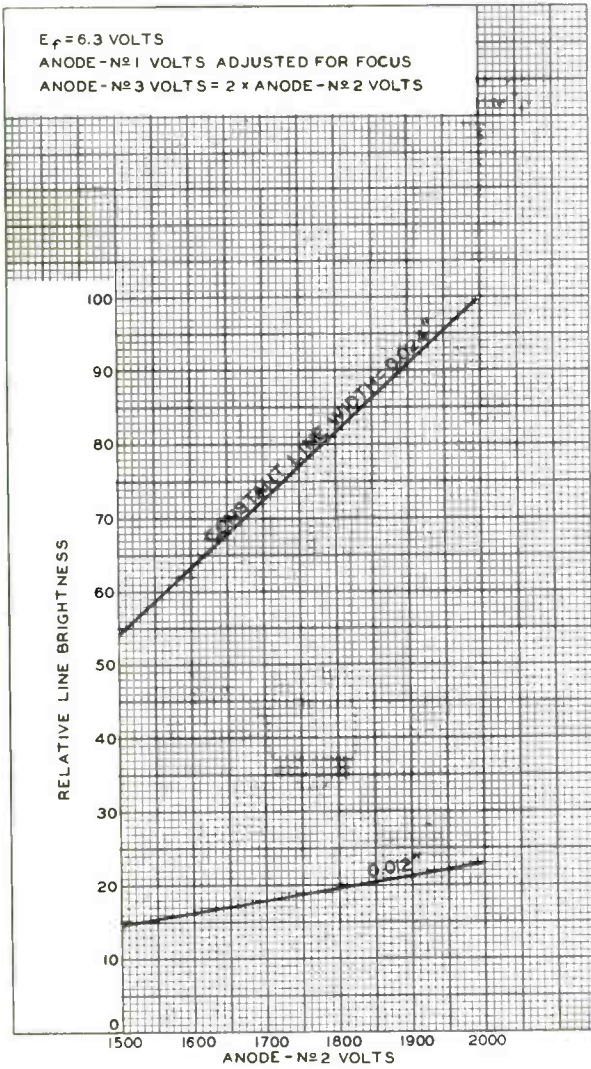


℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE

92CM-6408R4

5CPI-A

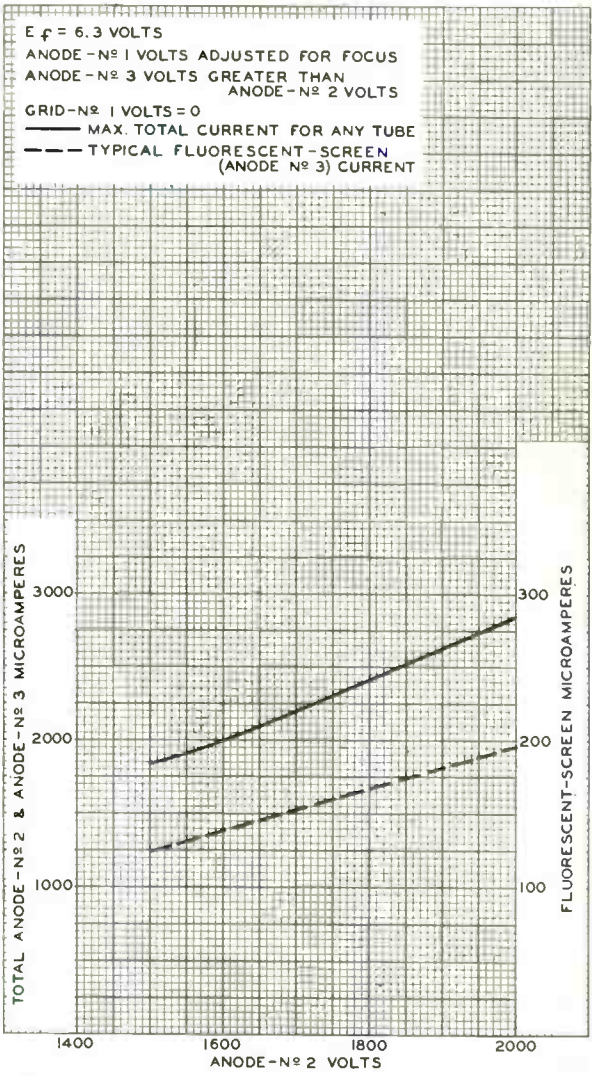
5CPI-A
CHARACTERISTICS



RCA

5CP1-A

CHARACTERISTICS



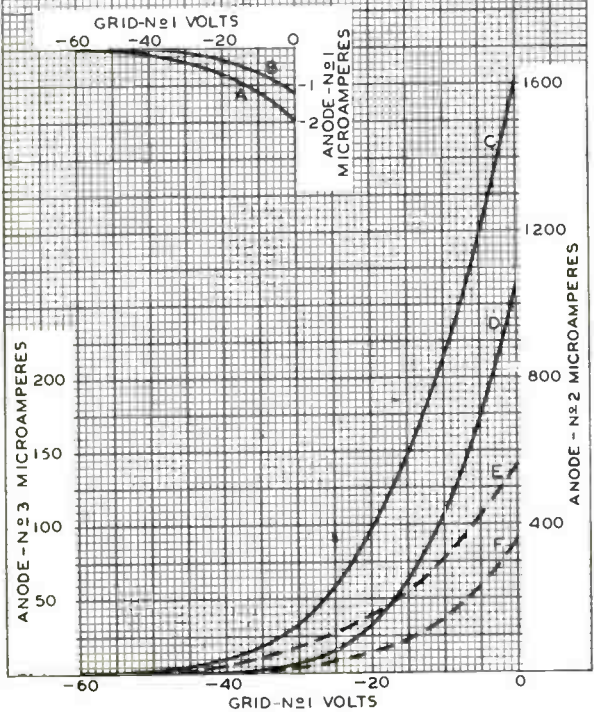
RCA

5CPI-A

AVERAGE CHARACTERISTICS

E_f = 6.3 VOLTS
ANODE-№1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE-№2 VOLTS	ANODE-№3 VOLTS
A	ANODE №1	2000	2000-4000
B	ANODE №1	1500	1500-3000
C	ANODE №2	2000	4000
D	ANODE №2	1500	3000
E	ANODE №3	2000	4000
F	ANODE №3	1500	3000



DEC. 26, 1946

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92CM-6414R2

5CP11-A
OSCILLOGRAPH TUBE

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 5CP11-A is also quite useful 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.

5CP12

OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR
ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

The 5CP12 is the same as the 5CP1-A except that it utilizes a medium-long-persistence screen which exhibits orange fluorescence and phosphorescence.

Because of its medium-long persistence, the 5CP12 is particularly useful where low- and medium-speed recurring phenomena are to be observed. However, it may also be used for observing low-and medium-speed, non-recurring phenomena but its efficiency is low. The persistence is such that the 5CP12 can be operated with scanning frequencies as low as 10 cycles per second without excessive flicker.

It will be noted that the phosphorescence decays exponentially with a time constant of about 120 milliseconds with the result that the low-level phosphorescence is of relatively short duration. Because of this characteristic, the 5CP12 provides high contrast between new and old information with change in target position. Therefore, the 5CP12 is suitable for short-range radar equipment involving medium-speed recurrent phenomena.

The P12 screen is more susceptible to burning than other phosphors. Therefore, the 5CP12 should be operated with the rated maximum anode-No.3 voltage and with the lowest anode-No.3 current which will give the desired brightness.

THE SPECTRAL-ENERGY EMISSION CHARACTERISTIC and the PERSISTENCE CHARACTERISTIC of the P12 Phosphor are shown at the front of this Section.

View-Finder Kinescope

MAGNETIC FOCUS — MAGNETIC DEFLECTION

GENERAL DATA

Electrical:

Direct Interelectrode Capacitances:	
Cathode to all other electrodes	8 pf
Grid No.1 to all other electrodes	5 pf
Heater Current at 6.3 volts	600 ma

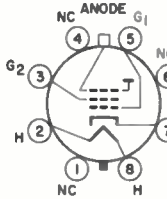
Optical:

Phosphor (For curves, see front of this section)	P4—Sulfide Type
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angle (Approx.)	53°

Mechanical:

Overall Length	11-1/8" ± 3/8"
Greatest Diameter	4-15/16" ± 3/32"
Minimum Useful Screen Diameter	4-1/4"
Cap	Recessed Small Ball (JEDEC No.J1-22)

Bases (Alternates):
- Long Medium-Shell Octal:
  - 8-Pin (JEDEC Group 1, No.B8-65)
  - 5-Pin (JEDEC Group 1, No.B5-80)
- Medium-Shell Octal 8-Pin:
  - 8-Pin (JEDEC Group 1, No.B8-11)



Pin 1 – No Internal Connection
Pin 2 – Heater
Pin 3 – Grid No.2
Pin 4 – Same as Pin 1
Pin 5 – Grid No.1
Pin 6 – Same as Pin 1
Pin 7 – Cathode
Pin 8 – Heater
Cap – Anode (Grid No.3, Collector)

Maximum Ratings, *Design-Center Values:*

ANODE VOLTAGE[a]	8000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

5FP4A

Typical Operation:

Anode Voltage[b]	6000	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-25 to -70	volts
Focused-Coil Current (DC, approx.)[c]	120 ± 15%	ma

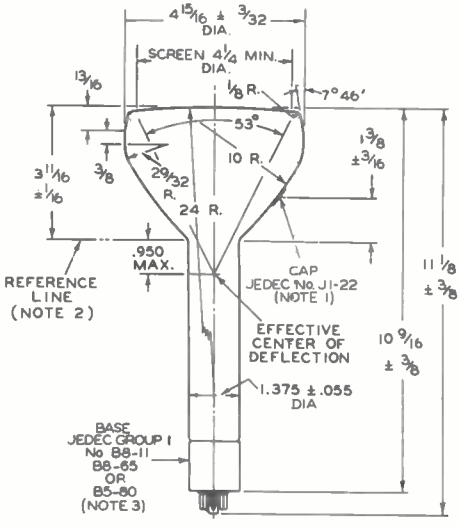
Maximum Circuit Values:

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

[a] The product of anode voltage and average anode current should be limited to 6 watts.

[b] 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 kinescope 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 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 10 foot-lamberts on a 3-7/8" x 2-7/8" picture area sharply focused at center of screen.



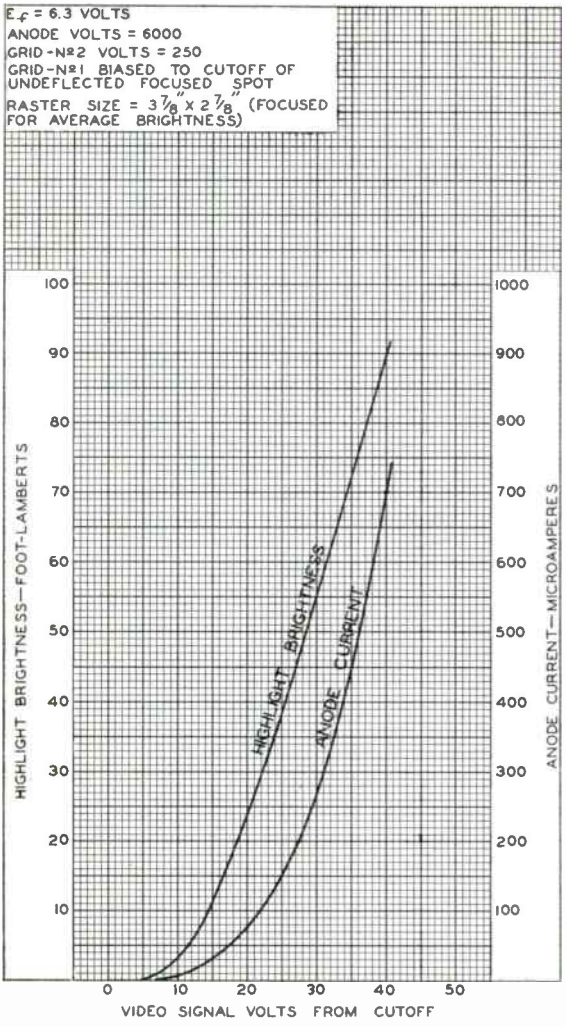
DIMENSIONS IN INCHES

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 10°. ANODE 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 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

AVERAGE GRID-DRIVE CHARACTERISTICS



92CM - 6683RI

5FP7-A

OSCILLOGRAPH TUBE

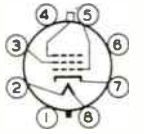
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6	amp
Direct Interelectrode Capacitances:		
Grid No.1 to All Other Electrodes	8	μμf ←
Cathode to All Other Electrodes	5	μμf
Phosphor (For Curves, see front of this Section)		P7
Fluorescence		Blue
Phosphorescence		Greenish-Yellow
Persistence of Phosphorescence		Long
Focusing Method		Magnetic
Deflection Method		Magnetic
Deflection Angle (Approx.)		53°
Overall Length		11-1/8" ± 3/8"
Greatest Diameter of Bulb		4-15/16" ± 3/32"
Minimum Useful Screen Diameter		4-1/4"
Mounting Position		Any
Cap		Recessed Small Ball (JETEC No.J1-22)
Base		Long Medium-Shell Octal 8-Pin (JETEC No.B8-65)

BOTTOM VIEW



Pin 1 – No Connection
Pin 2 – Heater
Pin 3 – Grid No.2
Pin 4 – No Connection
Pin 5 – Grid No.1
Pin 6 – No Connection
Pin 7 – Cathode
Pin 8 – Heater
Cap – Anode

Maximum Ratings, *Design-Center Values*:

ANODE VOLTAGE	8000 max.	volts
GRID-No.2 VOLTAGE	700 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	180 max.	volts ←
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**	4000	7000	volts
Grid-No.2 Voltage	250	250	volts

* 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.

← Indicates a change.

5FP7-A

OSCILLOGRAPH TUBE

Grid-No.1 Voltage°	−25 to −70	−25 to −70	volts
→ Grid-No.2 Current.	−15 to +15	−15 to +15	μamp
Focusing-Coil 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 air gap 2-3/4 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.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5FP15-A
OSCILLOGRAPH TUBE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 ± 10% . . . . . amp

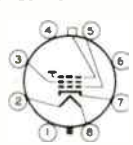
Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to all other electrodes . . . . . 8 μμf
- Cathode to all other electrodes . . . . . 5 μμf

Faceplate, Spherical . . . . . Clear Glass
Phosphor (For Curves, see front of this Section) P15
- Fluorescence—
  - Visible radiation . . . . . Blue-Green
  - Invisible radiation . . . . . Near-Ultraviolet
- Phosphorescence—
  - Persistence of visible radiation . . . . . Very Short
  - Persistence of invisible radiation . . . Extremely Short

Focusing Method . . . . . Magnetic
Deflection Method . . . . . Magnetic
Deflection Angle (Approx.) . . . . . 53°
Tube Dimensions:
- Overall length . . . . . 11-1/8" ± 3/8"
- Greatest diameter of bulb . . . . . 4-15/16" ± 3/32"

Minimum Useful Screen Diameter . . . . . 4-1/4"
Weight (Approx.) . . . . . 1 lb 2 oz
Mounting Position . . . . . Any
Cap . . . . . Recessed Small Ball (JETEC No.J1-22)
Bulb J-39-1/2
Base . . . . . Medium-Shell Octal 8-Pin (JETEC No.B8-11)
- Basing Designation for BOTTOM VIEW 5AN

Pin 1 – No Connection
Pin 2 – Heater
Pin 3 – Grid No.2
Pin 4 – No Connection
Pin 5 – Grid No.1



Pin 6 – No Connection
Pin 7 – Cathode
Pin 8 – Heater
Cap – Ultor (Grid No.3, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	8000 max. volts
GRID-No.2 VOLTAGE	700 max. volts
GRID-No.1 VOLTAGE:	
Negative bias value	180 max. volts
Positive bias value*	0 max. volts
Positive peak value	2 max. volts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode	125 max. volts
Heater positive with respect to cathode	125 max. volts

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

5FP15-A

OSCILLOGRAPH TUBE

Equipment Design Ranges:

For any ultor voltage (E_{c_3}) between 4000# and 8000 volts and grid-No.2 voltage (E_{c_2}) between 150 and 700 volts

Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	−10% to −28% of E_{c_2}	volts
Grid-No.2 Current	−15 to +15	μamp
Focusing-Coil Current (DC)[oo]	$\left[\sqrt{E_{c_3}/4000} \times 96\right] \pm 15\%$	ma
Spot Position	##	

Examples of Use of Design Ranges:

For ultor voltage of and grid-No.2 voltage of	*4000 250*	*5000 250*	*volts volts*
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	−25 to −70	−25 to −70	volts
Focusing-Coil Current (DC)	82 to 110	91 to 123	ma

Maximum Circuit Values:

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

SPECIAL PERFORMANCE DATA

Line Width:

For Ultor Voltage of 4000 Volts	0.010 max.▲	inch
For Ultor Voltage of 5000 Volts	0.009 max.▲	inch

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

oo For specimen focusing coil similar to JETEC Focusing Coil No.106 positioned with air gap toward faceplate and center line of air gap 2-3/4" from Reference Line *(See Dimensional Outline)* and ultor current of 200 microamperes.

\## With the tube shielded from extraneous fields, the center of the undeflected, unfocused, low-intensity spot will fall within a circle having a 9-mm radius concentric with the center of the tube face.

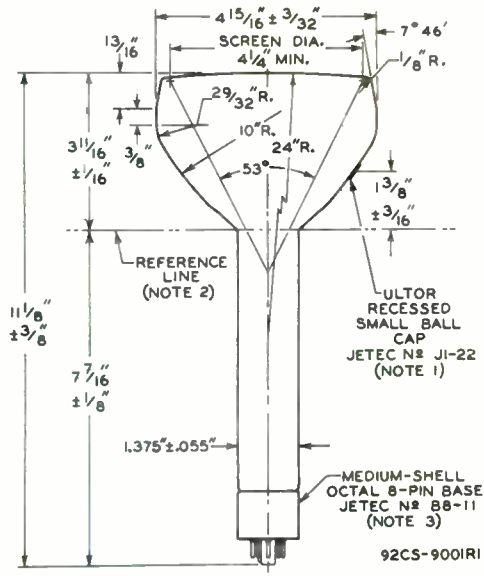
▲ With JETEC Deflecting Yoke No.120, or equivalent, and under the following conditions: heater voltage of 6.3 volts, ultor current of 200 microamperes, grid-No.2 voltage of 250 volts, and a 49-line raster. Raster width is adjusted to 11.4 cm and focusing-coil current is adjusted to give sharpest focus at center of tube face. Raster height is contracted until individual scanning lines are just barely distinguishable. *Line width* is expressed as the quotient of the contracted raster height measured at the centerline of the tube face divided by the number of scanning lines (49).

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

5FP15-A

OSCILLOGRAPH TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. ULTOR TERMINAL IS ON SAME SIDE OF TUBE AS PIN 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: CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

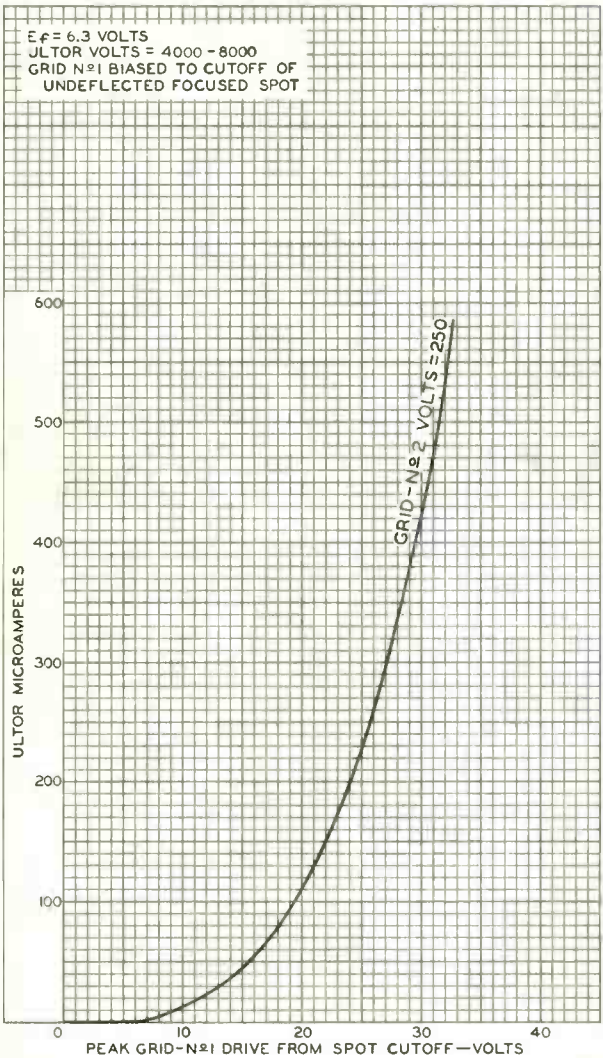
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5FP15-A

RCA

5FP15-A

AVERAGE GRID-DRIVE CHARACTERISTIC



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9002

5TP4
PROJECTION KINESCOPE

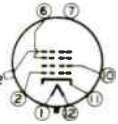
ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA

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	7.5	μμf
Cathode to All Other Electrodes	5.0	μμf
External Conductive Coating to Anode No.2	500 max.	μμf
	100 min.	μμf
Phosphor (For 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.)		50°
Overall Length		11-3/4" ± 3/8"
Greatest Diameter of Bulb		5" ± 1/8"
Minimum Useful Screen Diameter		4-1/2"
Minimum Optical-Quality-Circle Diameter		4-1/4"
Mounting Position		Any
Cap		Recessed Small Cavity
Base		Small-Shell Duodecal 7-Pin
Basing Designation for BOTTOM VIEW		12C

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

Maximum Ratings, *Design-Center Values*:

ANODE-No.2 VOLTAGE	27000 max.	volts
ANODE-No.1 VOLTAGE	6000 max.	volts
GRID-No.2 VOLTAGE	350 max.	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative bias value	150 max.	volts
Positive bias value	0 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 seconds	410 max.	volts ←
After equipment warm-up period	175 max.	volts ←
Heater positive with respect to cathode	10 max.	volts

Typical Operation:

Anode-No.2 Voltage*	27000	volts
Anode-No.1 Voltage for Focus when anode-No.2 current is 200 μa.	4320 to 5400	volts ←

* See next page. ← Indicates a change.

5TP4
PROJECTION KINESCOPE

Grid-No.2 Voltage**	200	volts
→ Grid-No.1 Voltage for Visual Cutoff°	-42 to -98	volts
Anode-No.2 Current	200	μa
→ Max. Anode-No.1 Current	65	μa
Max. Grid-No.2 Current	±15	μa

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	180 min.	ohms
Grid-No.2-Circuit Resistance	390 min.	ohms
Anode-No.1-Circuit Resistance	6800 min.	ohms
Anode-No.2-Circuit Resistance	30000 min.	ohms

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

Components:

Deflection Yoke	RCA Type No.201D2
Horizontal Output Transformer (for use with two 6BG6-G's)	RCA Type No.211T2
Vertical Output Transformer	RCA Type No.204T2

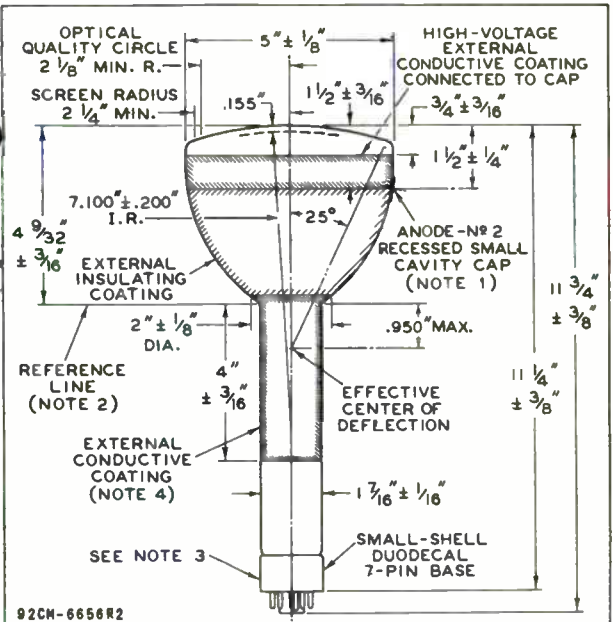
* Brilliance and definition decrease with decreasing anode voltages. In general, anode No.2 voltage should not be less than 20000 volts.

** Subject to variation of ±10% if it is desired to operate any tube at a grid-No.1 cutoff bias of -70 volts.

° Visual extinction of undeflected focused spot.

→ Indicates a change.

5TP4
PROJECTION KINESCOPE



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-No. 2 TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10°. 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.

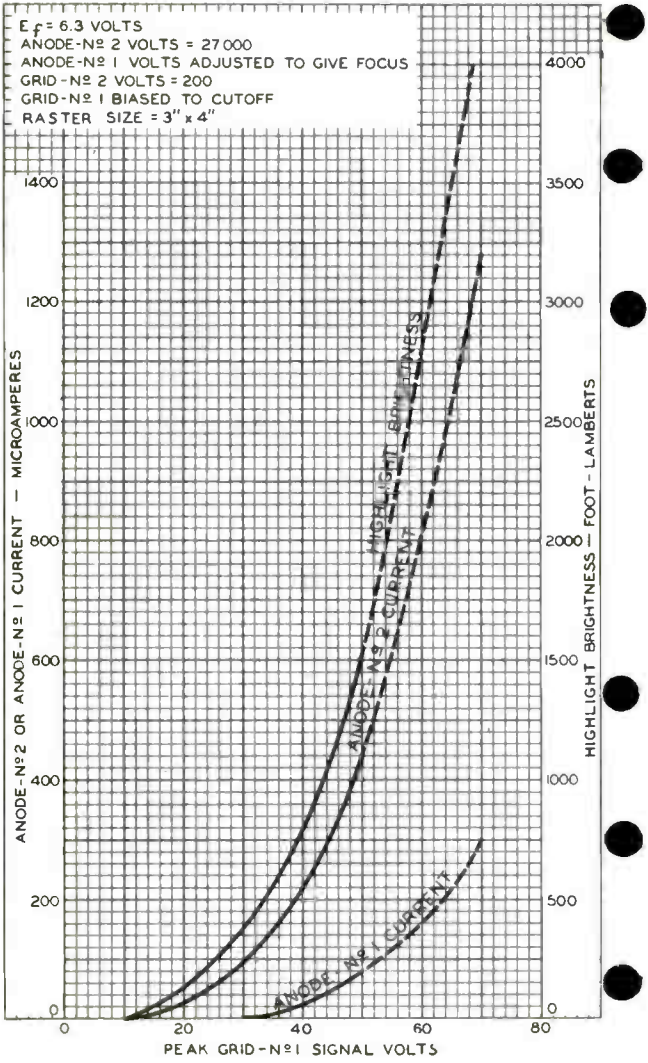
NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

5TP4

RCA

5TP4

AVERAGE CHARACTERISTICS



FEB. 7, 1946

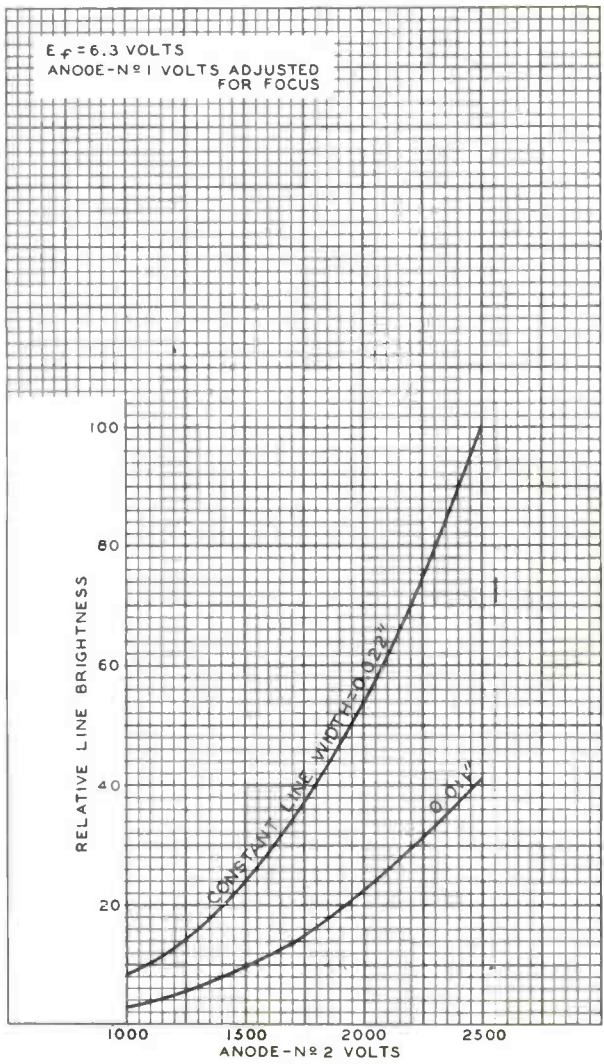
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6670

RCA

5UP1

AVERAGE CHARACTERISTICS

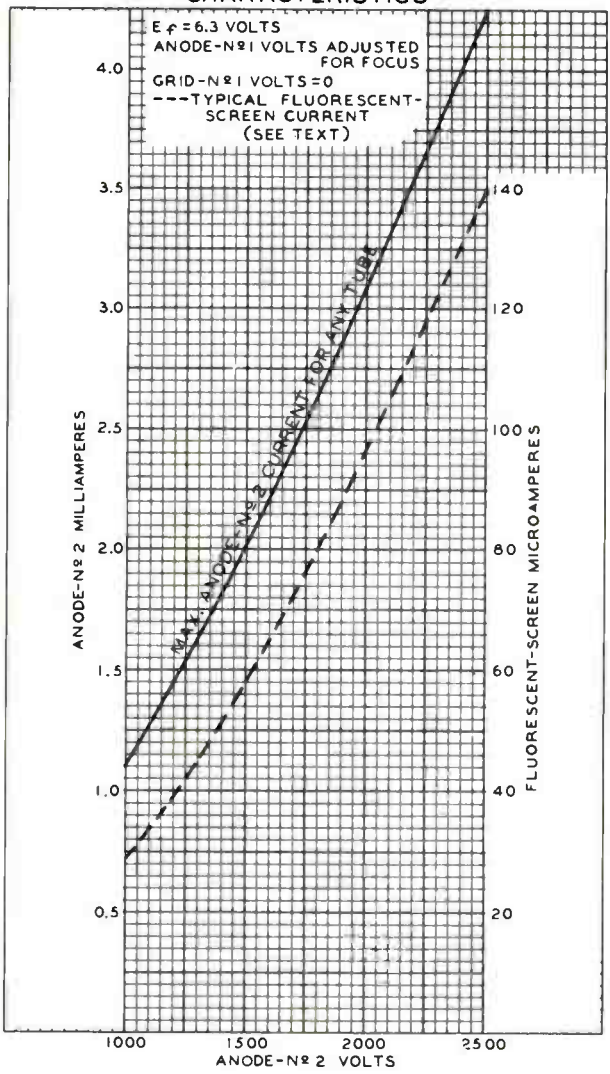


5UP1

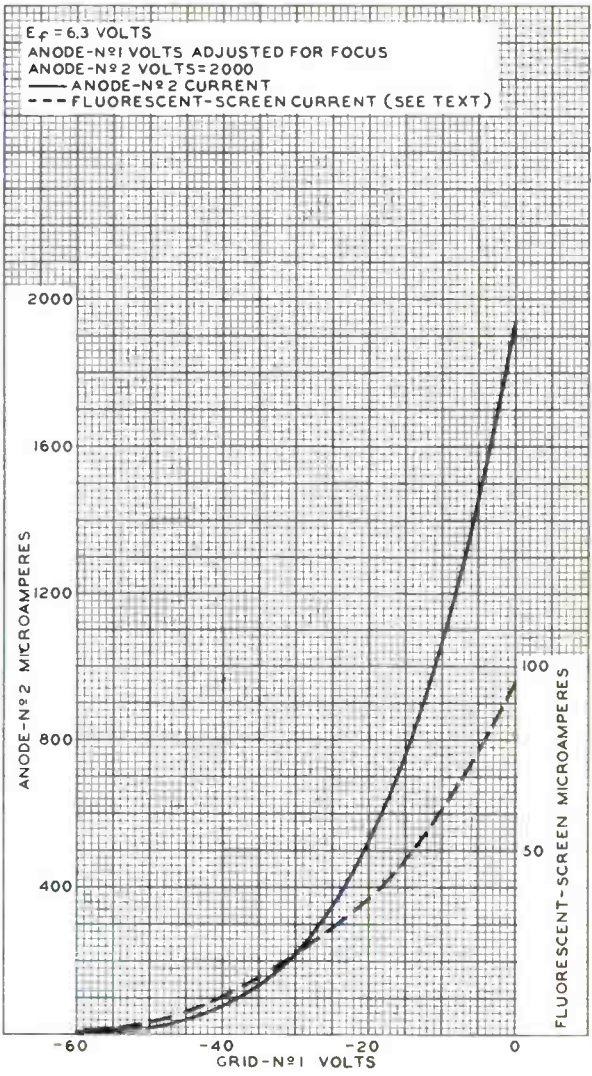
RCA

5UP1

CHARACTERISTICS



AVERAGE CHARACTERISTICS



5UP7

Oscillograph Tube

ELECTROSTATIC FOCUS **ELECTROSTATIC DEFLECTION**

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:

GENERAL

Phosphor (For curves, see front of this section) P7
Fluorescence . . . . . White
Phosphorescence . . . . . Yellowish-Green
Persistence[a,b] . . . . . Very-Long

5UP11

Oscillograph Tube

ELECTROSTATIC FOCUS **ELECTROSTATIC DEFLECTION**

For Photographic Recording and Visual Observations

The 5UP11 is the same as the 5UP1 except for the following items:

GENERAL

Phosphor (For curves, see front of this section) P11
Fluorescence . . . . . Actinic-Blue
Phosphorescence . . . . . Actinic-Blue
Persistence[a,b] . . . . . Medium-Short

5UP31

Oscillograph Tube

ELECTROSTATIC FOCUS **ELECTROSTATIC DEFLECTION**

For Low- or Medium-Speed Non-Recurring Image Displays

The 5UP31 is the same as the 5UP1 except for the following items:

GENERAL

Phosphor (For curves see type 7VP31) P31
Fluorescence . . . . . Green
Phosphorescence . . . . . Green
Persistence[b] . . . . . Medium-Short[c] (Approx. 38 μsec)

[a] Persistence of useable brightness can be obtained with an anode-No. 2 voltage of as low as 1500 volts.

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

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

RCA

5WP11

TRANSCRIBER KINESCOPE

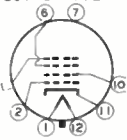
ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6	amp
Direct Interelectrode Capacitances:		
Grid No.1 to All Other Electrodes	7.5	μμf
Cathode to All Other Electrodes	5	μμf
External Conductive Coating to Anode No.2	500 max. / 100 min.	μμf
Phosphor (For Curves, see front of this Section)		P11
Fluorescence		Blue
Persistence		Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angle (Approx.)		50°
Overall Length		11-7/16" ± 3/8"
Greatest Diameter of Bulb		5" ± 1/8"
Minimum Useful Screen Diameter		4-1/4"
Raster Size (Approx.)		2-1/2" x 3-3/8"
Mounting Position		Any
Cap		Recessed Small Cavity
Base		Small-Shell Duodecal 7-Pin
Basing Designation for BOTTOM VIEW		12C

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

Maximum Ratings, *Design-Center Values*:

ANODE-No.2 VOLTAGE	27000 max.	volts
ANODE-No.1 VOLTAGE	6000 max.	volts
GRID-No.2 VOLTAGE	350 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	150 max.	volts
Positive bias value	0 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 seconds	410 max.	volts
After equipment warm-up period	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

Typical Operation:

Anode-No.2 Voltage*	27000	volts

*: See next page.

5WP11

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	μamp
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 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	180 min.	ohms
Grid-No.2-Circuit Resistance	390 min.	ohms
Anode-No.1-Circuit Resistance	6800 min.	ohms
Anode-No.2-Circuit Resistance	30000 min.	ohms

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

Components:

Deflecting Yoke	RCA Type No. 201D11
Hor. Deflection Output Transformer:	
For use with 6AS7-G booster scanning tube and separate high-voltage supply	RCA Type No. 204T1
For use with single high-voltage tripler supply employing 3 1B3-GT/8016's	RCA Type No. 211T2
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 -70 volts.

OPERATING NOTES

Soft x-rays are produced when the 5WP11 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 5WP11. 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 band-width of at least 10 megacycles.

RCA

5WP11

TRANSCRIBER KINESCOPE

The screen of the 5WP11 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.

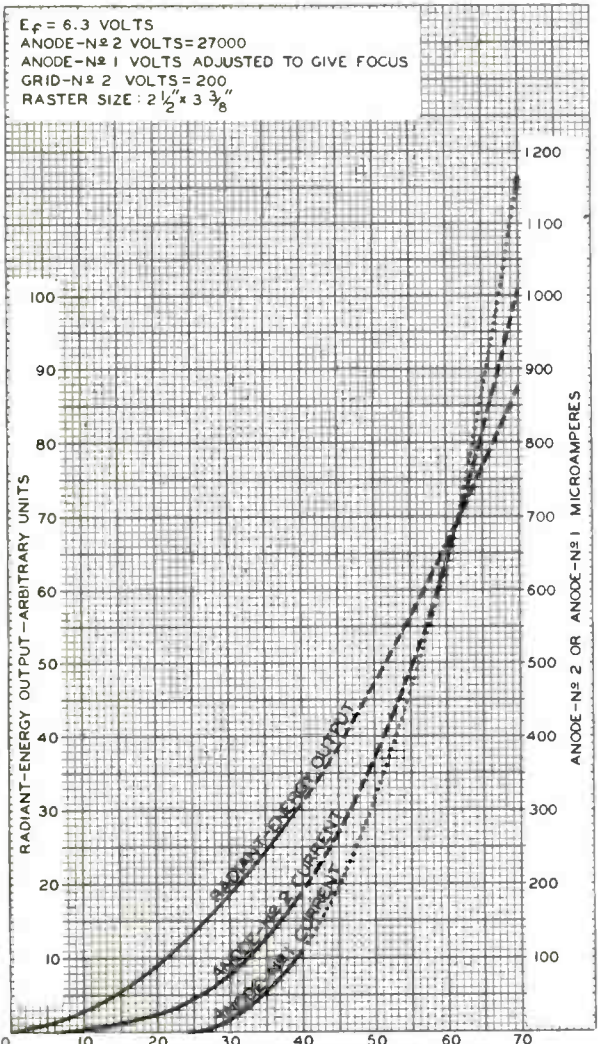
Operation of the 5WP11 results in gradual browning of the face. The rate of browning increases markedly with increase in anode-No.2 voltage, is proportional to beam current, and is inversely proportional to the scanned area. The browning is most noticeable during initial operation; thereafter, a gradual 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

RCA

5WP11

AVERAGE CHARACTERISTICS



5WP15
FLYING-SPOT CATHODE-RAY TUBE

ALUMINIZED SCREEN

ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

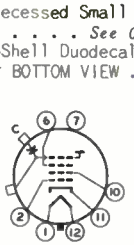
For use as scanner in flying-spot video-signal generators

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp
Direct Interelectrode Capacitances:	
Grid No.1 to all other electrodes	8 μμf
Cathode to all other electrodes	5 μμf
External conductive neck coating to ultor	500 max. μμf; 100 min. μμf
Faceplate, Flat	Clear Glass
Phosphor (For Curves, see front of this Section)	P15 Aluminized
Fluorescence—	
Visible radiation	Green
Invisible radiation	Near Ultraviolet
Phosphorescence—	
Persistence of visible radiation	Short
Persistence of invisible radiation	Very Short
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle (Approx.)	50°
Tube Dimensions:	
Overall length	11-7/16" ± 3/8"
Greatest diameter of bulb	5" ± 1/8"
Minimum Useful Screen Diameter	4-1/4"
Weight (Approx.)	1-1/2 lbs
Operating Position	Any
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	12C

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:*

JLTOR VOLTAGE	27000 max. volts
GRID-No.3 VOLTAGE	6000 max. volts
GRID-No.2 VOLTAGE	350 max. volts

→ Indicates a change.

RCA

5WP15

FLYING-SPOT CATHODE-RAY TUBE

GRID-No.1 VOLTAGE:		
Negative bias value	150 max.	volts
Positive bias value	0 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 seconds	410 max.	volts
→ After equipment warm-up period	150 max.	volts
→ Heater positive with respect to cathode	150 max.	volts

→ **Equipment Design Ranges:**

For any ultor voltage (E_{c_4}) between 15000 and 27000 volts*

Grid-No.3 Voltage for focus with ultor current of 150 μa or less	15% to 19% of E_{c_4}	volts
Grid-No.2 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed grid-No.1 voltage	2 to 5 times E_{c_1}	volts
Grid-No.1 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed grid-No.2 voltage	−20% to −50% of E_{c_2}	volts
Maximum Grid-No.3 Current for ultor current of 150 μa	200	μa
Grid-No.2 Current	−15 to +15	μa

→ **Examples of Use of Design Ranges:**

For ultor voltage of	*20000*	*27000*	*volts*
Grid-No.3 Voltage for focus with ultor current as indicated	3000 to 3800	4000 to 5200	volts
Grid-No.2 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed grid-No.1 voltage of −70 volts	140 to 350	140 to 350	volts
Grid-No.1 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed grid-No.2 voltage of 200 volts	−40 to −100	−40 to −100	volts
Ultor Current	150	100	μa

Maximum Circuit Values:

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

*: See next page. → Indicates a change.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5WP15

FLYING-SPOT CATHODE-RAY TUBE

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 15,000 volts.

OPERATING CONSIDERATIONS

X-Ray Warning. X-ray radiation is produced at the face of the 5WP15 when it is operated at its normal ultor voltage. These rays can constitute a health hazard, unless the tube is 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 5WP15 fit the Duodecal 12-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, arc-resistant, insulating material and should preferably be designed with baffles.

Resolution of better than 800 lines at the center of the reproduced picture can be produced by the 5WP15 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 *screen* of the 5WP15 has radiation in the visible green region and in the invisible near-ultraviolet region. The frequency response of the ultraviolet radiation is substantially constant for a range of 3 megacycles and then decreases exponentially toward zero at approximately 100 megacycles.

The P15 screen is more sensitive to heat than other standard types of phosphors. It shows a decrease in efficiency with increase in temperature. Use of forced air from a small blower directed against the face of the tube is, therefore, suggested to counteract the heating effect of the electron beam if optimum efficiency of the screen is desired at maximum ultor current.

Care should be taken to avoid under-scanning over a protracted period because such an underscanned area will be burned and thus give diminished radiation when the raster is scanned to full size and be apparent 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 face will be burned unevenly over the pattern area. When a modulated stationary pattern is used, it is recommended that the ultor current be limited to an instantaneous value of about 150 microamperes.

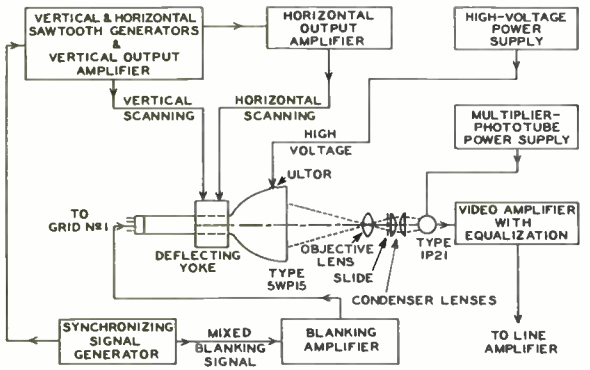
← Indicates a change.

5WP15

FLYING-SPOT CATHODE-RAY TUBE

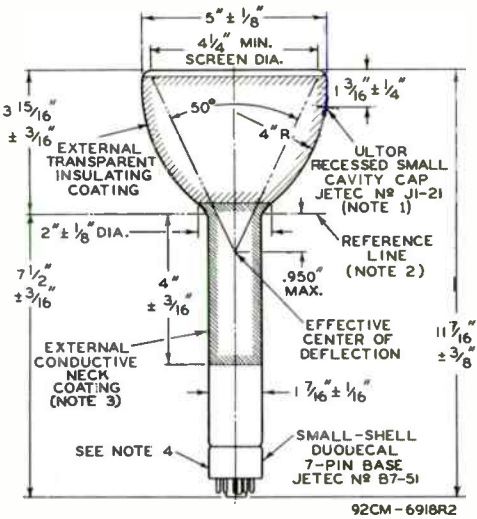
Because of the high peak energy in the beam, the screen will be seriously damaged if the beam is allowed to remain stationary, even momentarily. Provision should be made to prevent such a possibility. Provision should also be made in equipment design to insure that the ultor voltage will drop as fast as the scanning current when the equipment is turned off; or to bias grid No.1 to beam-current cutoff when the equipment is turned off.

BLOCK DIAGRAM OF FLYING-SPOT VIDEO-SIGNAL GENERATOR SYSTEM FOR SLIDE TRANSPARENCIES



5WP15

FLYING-SPOT CATHODE-RAY TUBE



NOTE 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 ± 10°. THE ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION 3.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + 0.003" − 0.000" I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: EXTERNAL CONDUCTIVE NECK COATING MUST BE GROUNDED.

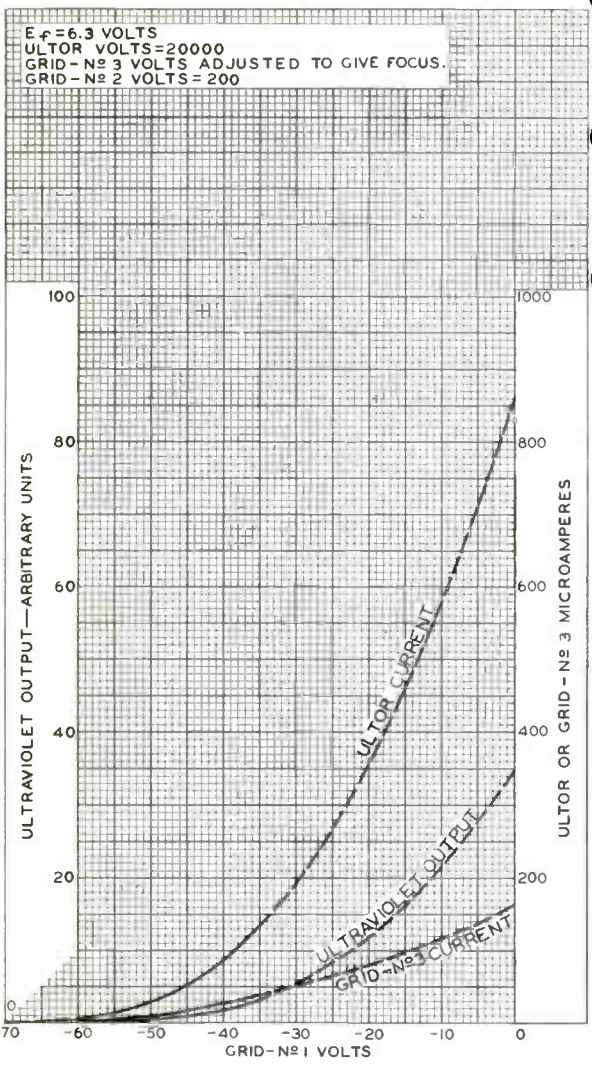
NOTE 4: ℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

5WP15

RCA

5WP15

AVERAGE CHARACTERISTICS

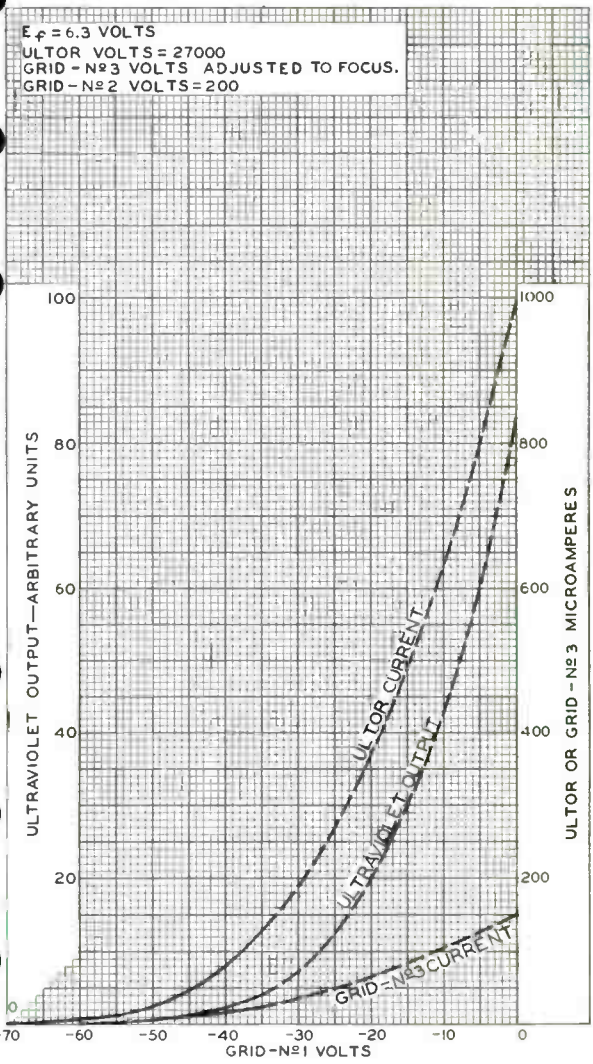


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-6916RI

RCA

5WP15

AVERAGE CHARACTERISTICS



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

92CM-6917R1

5ZP16

FLYING-SPOT CATHODE-RAY TUBE

HIGH RESOLUTION CAPABILITY — ALUMINIZED SCREEN
ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

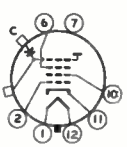
For use as scanner in high-quality flying-spot video-signal generators

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	8	μμf
Cathode to all other electrodes	5	μμf
External conductive neck coating to ultor	500 max.	μμf
	100 min.	μμf
Faceplate, Flat		Clear Glass
Phosphor (For Curves, see front of this Section)		P16 Aluminized
Fluorescence—		
Visible radiation		Violet
Invisible radiation		Near Ultraviolet
Phosphorescence—		
Persistence of visible radiation		Very Short
Persistence of invisible radiation		Very Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angle (Aporox.)		40°
Tube Dimensions:		
Overall length		14-3/8' ± 3/8"
Greatest diameter of bulb		5" ± 1/8"
Minimum Useful Screen Diameter		4-1/4"
Weight (Approx.)		1-1/2 lbs
Operating Position		Any
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		12C

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.

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

5ZP16

FLYING-SPOT CATHODE-RAY TUBE

GRID-No.1 VOLTAGE:		
Negative bias value	150 max.	volts
Positive bias value	0 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 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

→ Equipment Design Ranges:

For any ultor voltage (E_{c_4}) between 20000 and 27000 volts*

Grid-No.3 Voltage for focus with ultor current of 25 μa or less	20.5% to 26.5% of E_{c_4}	volts
Grid-No.2 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed grid-No.1 voltage	2 to 5 times E_{c_1}	volts
Grid-No.1 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed grid-No.2 voltage	−20% to −50% of E_{c_2}	volts
Grid-No.2 Current	−15 to +15	μa

→ Examples of Use of Design Ranges:

For ultor voltage of	*20000*	*27000*	*volts*
Grid-No.3 Voltage for focus with ultor current as indicated	4100 to 5300	5500 to 7100	volts
Grid-No.2 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed grid-No.1 voltage of −70 volts	140 to 350	140 to 350	volts
Grid-No.1 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed grid-No.2 voltage of 200 volts	−40 to −100	−40 to −100	volts
Ultor Current	25	15	μa

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 20,000 volts.

→ Indicates a change.

RCA

5ZP16

FLYING-SPOT CATHODE-RAY TUBE

OPERATING CONSIDERATIONS

X-Ray Warning. X-ray radiation is produced at the face of the 5ZP16 when it is operated at its normal ultor voltage. These rays can constitute a health hazard unless the tube is 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 5ZP16 fit the Duodecal 12-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, arc-resistant, 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 5ZP16 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 5ZP16 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.

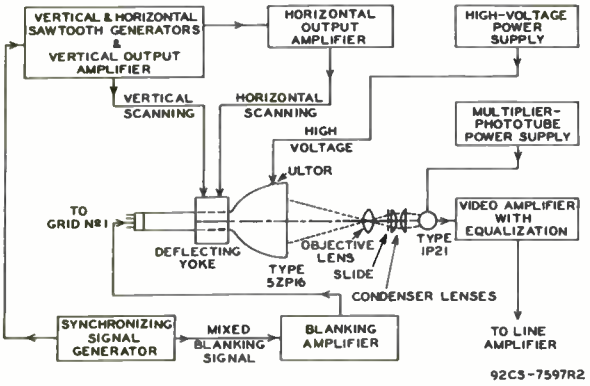
Never allow the beam to remain stationary, even momentarily, because the high peak energy in the beam will seriously damage the screen. Provision should be made to prevent such a possibility. Provision should also be made in equipment design to insure that the ultor voltage will drop as fast as the scanning current when the equipment is turned off; or to bias grid No.1 to beam-current cutoff when the equipment is turned off.

←Indicates a change.

5ZP16

FLYING-SPOT CATHODE-RAY TUBE

BLOCK DIAGRAM OF FLYING-SPOT VIDEO-SIGNAL GENERATOR SYSTEM FOR SLIDE TRANSPARENCIES



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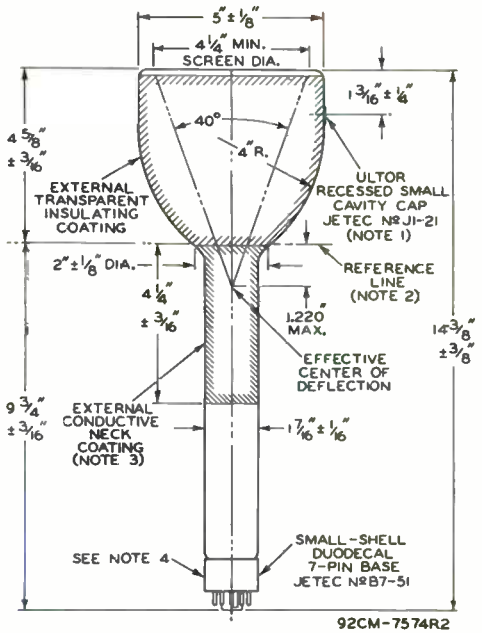
5ZP16

FLYING-SPOT CATHODE-RAY TUBE



NOTE 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 ± 10°. THE 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. 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.

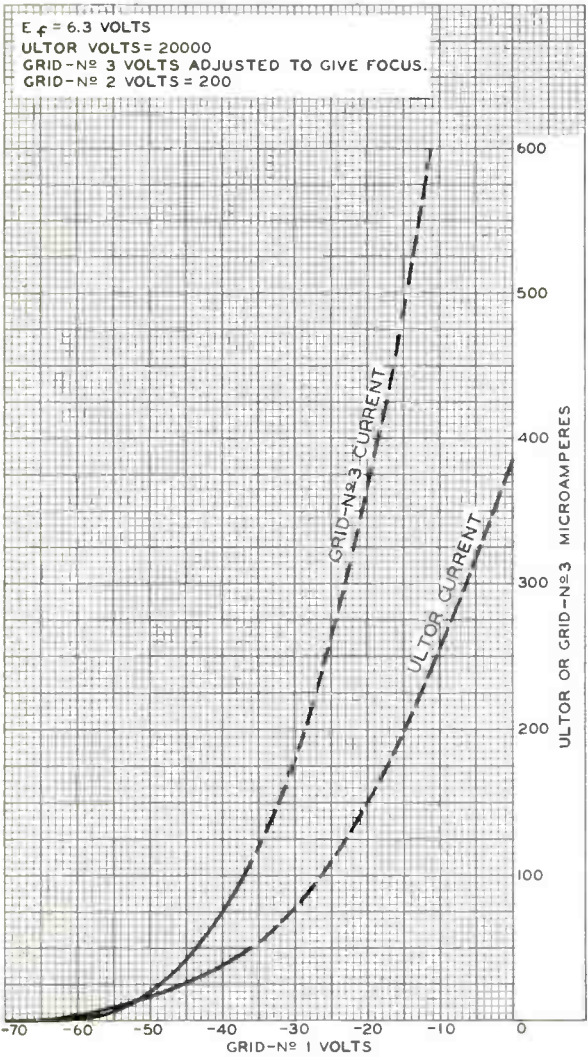
NOTE 3: EXTERNAL CONDUCTIVE NECK COATING MUST BE GROUNDED.

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

5ZP16

5ZP16

AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION 92CM-7575RI

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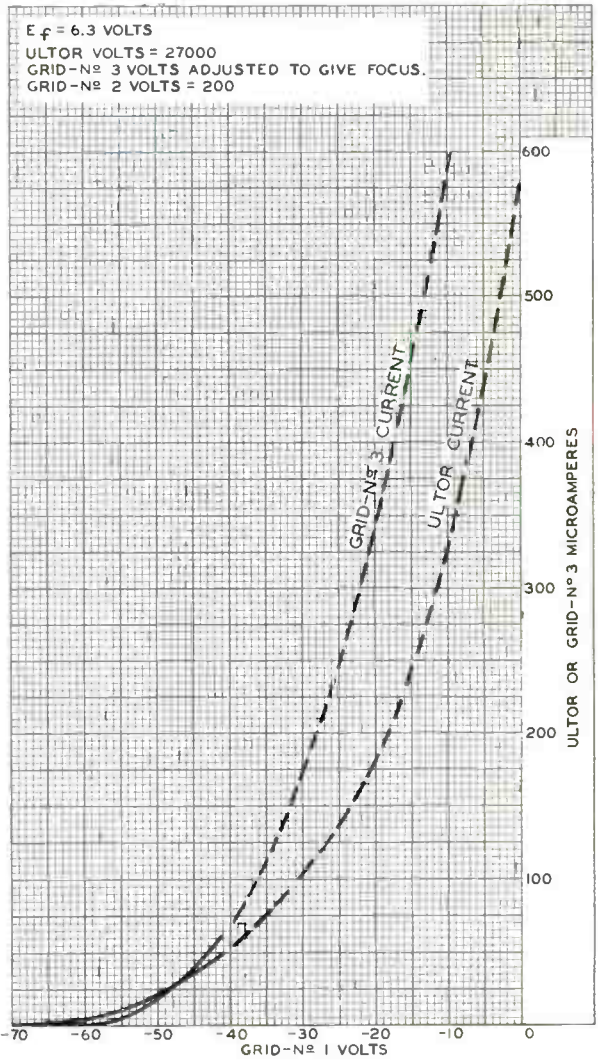
RCA

5ZP16

AVERAGE CHARACTERISTICS



7BP7-A

OSCILLOGRAPH TUBE

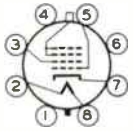
MAGNETIC FOCUS MAGNETIC DEFLECTION

DATA

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	8.5	μμf
Grid No.2 to All Other Electrodes	7	μμf
Cathode to All Other Electrodes	5	μμf
Phosphor (For Curves, see front of this Section)	No.7	
Fluorescence	Blue	
Phosphorescence	Greenish-Yellow	
Persistence of Phosphorescence	Long	
Focusing Method	Magnetic	
Deflection Method	Magnetic	
Deflection Angle (Approx.)	53°	
Overall Length	13-1/4" ± 3/8"	
Greatest Diameter of Bulb	7" ± 1/8"	
Maximum Useful Screen Diameter	6"	
Mounting Position	Any	
Cap	Recessed Small Ball	
Base	Long Medium-Shell Octal 8-Pin	

BOTTOM VIEW



Pin 1 – No Connection
Pin 2 – Heater
Pin 3 – Grid No.2
Pin 4 – No Connection
Pin 5 – Grid No.1
Pin 6 – No Connection
Pin 7 – Cathode
Pin 8 – Heater
Cap – Anode, Grid No.3

Maximum Ratings, *Design-Center Values*:

ANODE● VOLTAGE	8000 max.	volts
GRID-No.2 VOLTAGE	700 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
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*	4000	7000	volts
Grid-No.2 Voltage	250	250	volts
Grid-No.1 Voltage Range○	-25 to -70	-25 to -70	volts
Focusing-Coil Current▲	75 to 102	99 to 135	ma
Spot Position	#	–	

●,□,*,○,▲,#: See next page

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7BP7-A

7BP7-A
OSCILLOGRAPH TUBE

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	820 min.	ohms
Anode-Circuit Resistance	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 2-3/8" 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 12 mm radius concentric with the center of the tube face.

7JP4

PICTURE TUBE

ROUND GLASS TYPE

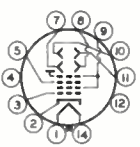
ELECTROSTATIC FOCUS — ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Faceplate, Spherical		Clear Glass
Phosphor (For curves, see front of this Section)		P4—Sulfide Type
Overall Length		14-1/2" ± 3/8"
Greatest Diameter of Bulb		7" ± 1/8"
Minimum Useful Screen Diameter		6"
Operating Position		Any
Base. .Medium-Shell Diheptal 12-Pin (JETEC Group 5, No.B12-37)		←
Basing Designation for BOTTOM VIEW		14R

Pin 1 – Heater
Pin 2 – Cathode
Pin 3 – Grid No.1
Pin 4 – No Connection
Pin 5 – Grid No.3
Pin 7 – Deflecting Electrode DJ_3
Pin 8 – Deflecting Electrode DJ_4



Pin 9 – Ultor (Grid No.2, Grid No.4, Collector)
Pin 10 – Deflecting Electrode DJ_2
Pin 11 – Deflecting Electrode DJ_1
Pin 12 – Internal Connection—Do Not Use
Pin 14 – Heater

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	6000 max.	volts
GRID-No.3 (FOCUSING) VOLTAGE	2800 max.	volts
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 ANY DEFLECTING ELECTRODE	750 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

←Indicates a change.

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

7JP4

PICTURE TUBE

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1.5 max.	megohms
Resistance in Any Deflecting-Electrode Circuit■.	5 max.	megohms

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

7MP7

OSCILLOGRAPH TUBE

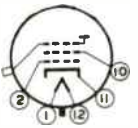
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

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	μμf
Cathode to All Other Electrodes	5	μμf
Phosphor (For Curves, see front of this Section)		P7
Fluorescence		Blue
Phosphorescence		Greenish-Yellow
Persistence		Long
Focusing Method		Magnetic
Deflection Method		Magnetic
Deflection Angle (Approx.)		50°
Overall Length		12-3/4" ± 3/8"
Greatest Diameter of Bulb		7-3/16" ± 1/8"
Minimum Useful Screen Diameter		6"
Mounting Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Base		Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

BOTTOM VIEW



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

• 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.

7MP7
OSCILLOGRAPH TUBE

Typical Operation:

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	-15 to +15	μamp
→ Focusing-Coil Current (DC Approx.)**	64 ± 15%	85 ± 15%	ma
→ Spot Position	-	##	

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 4000 volts.

° For visual extinction of undeflected, focused spot.

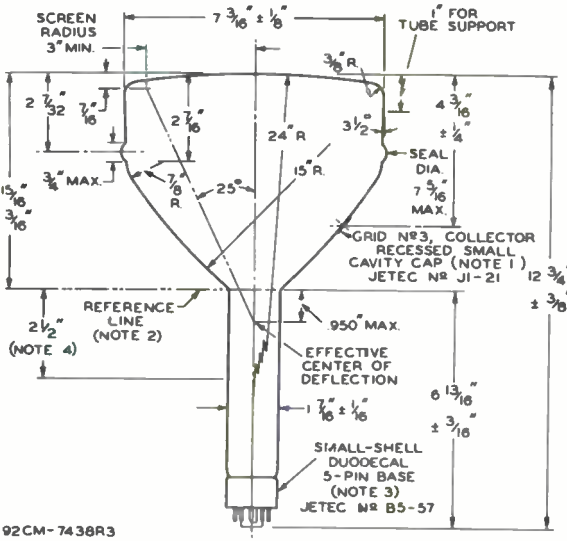
** For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward faceplate and center line of air gap 2-3/4" from Reference Line (see Outline Drawing) and ultor current of 200 microamperes.

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

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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" I. D. AND 2" LONG WILL REST ON BULB CONE.

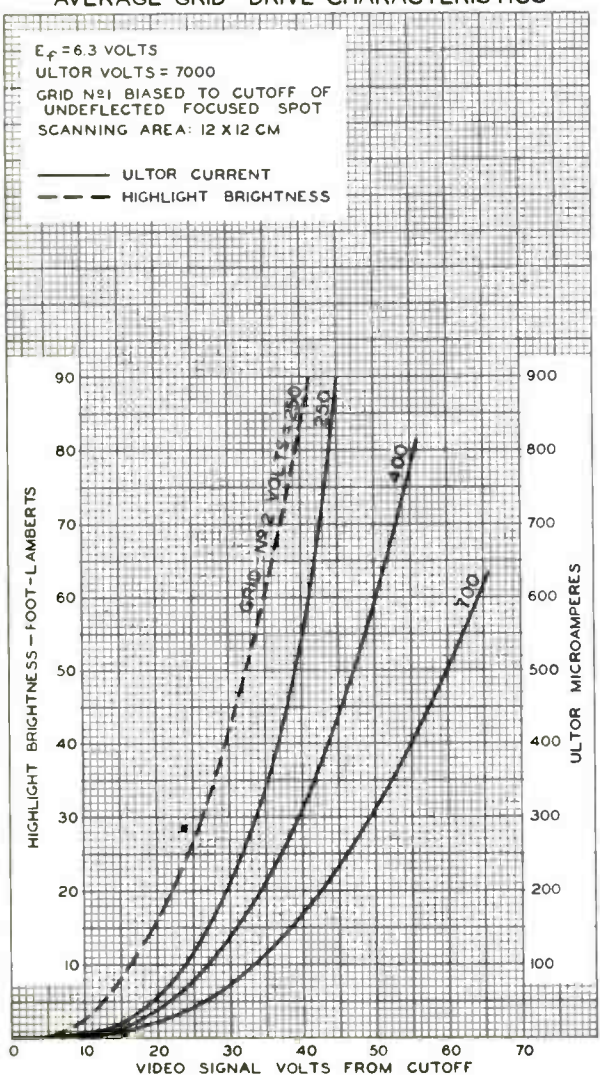
NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED: IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF 1-7/8".

NOTE 4: LOCATION OF DEFLECTING YOKE MUST BE WITHIN THIS SPACE.

RCA

7MP7

AVERAGE GRID-DRIVE CHARACTERISTICS



7MP14
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 a minute under conditions of adequate excitation and ambient light.

Because of its medium-long-persistence, the 7MP14 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

7NP4

PROJECTION KINESCOPE

20' x 15' PICTURES

FORCED-AIR COOLED — ALUMINIZED SCREEN
ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

For use in theater-television equipment

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.6 ± 5%	ac or dc volts ←
Current	0.62	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to all other electrodes	12	μμf
Cathode to all other electrodes	6	μμf
Phosphor	P4—Silicate-Sulfide Type Aluminized	
Fluorescence	White	
Phosphorescence	White	
Persistence	Medium	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angle (Approx.)	35°	
Projection-Throw Distance for 20' x 15' Picture	60 feet ←	
Overall Length	19-1/2" ± 5/8"	
Greatest Diameter of Bulb (Excluding side cap)	7" ± 3/16"	
Maximum Radius of Tube (Including side cap)	4-11/32"	
Quality Rectangle of Faceplate *(See Dimensional Outline)*	5" x 3-3/4"	
Refractive Index for Faceplate Glass	1.469 ←	
Weight (Approx.)	15 lbs ←	
Operating Position	Any	
Cap	Medium (JETEC No.C1-5) ←	
Socket	*See Operating Considerations*	
Base	Plastic-Filled, Small-Shell Diheptal 14-Pin (JETEC Group 5, No.B14-45) ←	
Basing Designation for BOTTOM VIEW	14N	

Pin 1 – Heater
Pin 2 – Cathode
Pin 3 – Grid No.1
Pin 4 – Grid No.2
Pin 5 – No Connection
Pin 6 – Same as Pin 5
Pin 7 – Same as Pin 5
Pin 8 – Same as Pin 5
Pin 9 – Same as Pin 5

Pin 10 – Same as Pin 5
Pin 11 – Same as Pin 5
Pin 12 – Same as Pin 5
Pin 13 – Internal Connection—Do Not Use
Pin 14 – Heater
Cap – Ultor (Grid No.4, Collector)

← Indicates a change.

7NP4

PROJECTION KINESCOPE

Air Flow to Face	40	cfm

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. The blower should have adequate capacity to provide for a total system-pressure drop including that of the air filter.

Face Temperature	100 max.	°C

CATHODE-DRIVE■ SERVICE

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

Maximum Ratings, *Absolute Values:*

ULTOR-TO-GRID-No.1 VOLTAGE●	80000 max.	volts
GRID-No.3-TO-GRID-No.1 VOLTAGE	20000 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	850 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	600 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive-bias value	250 max.	volts
Negative-bias value	0 max.	volts
Peak-negative value	2 max.	volts
AVERAGE ULTOR CURRENT	2 max.	ma
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	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

→ **Equipment Design Ranges:**

With any ultor-to-grid-No.1 voltage ($E_{c_4g_1}$) between 70000# and 80000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 400 and 850 volts

Grid-No.3-to-Grid-No.1 Voltage for focus	20% to 22.6% of $E_{c_4g_1}$	volts
Grid-No.2-to-Grid-No.1 Voltage for visual extinction of focused raster when circuit design utilizes fixed cathode-to-grid-No.1 voltage (Ekg_1)	3.2 to 4.8 times Ekg_1	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level) to White-Level Value	Same value as fixed cathode-to-grid-No.1 voltage except video drive is a negative voltage.	

■,●,#: See next page. → Indicates a change.

7NP4

PROJECTION KINESCOPE

Grid-No.3 Current.	0 to +15	μa
Grid-No.2 Current.	−15 to +15	μa

Examples of Use of Design Ranges:

For ultor-to-grid-No.1 voltage of	*75000*	*volts*
Grid-No.3-to-Grid-No.1 Voltage for focus.	15000 to 17000	volts
Grid-No.2-to-Grid-No.1 Voltage for visual extinction of focused raster when circuit design utilizes fixed cathode-to-grid-No.1 voltage (E_{kg_1}) of 125 volts.	400 to 600	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level) to White-Level Value.	−125	volts

Maximum Circuit Values:

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

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Absolute Values:*

ULTOR VOLTAGE●	80000 max.	volts
GRID-No.3 VOLTAGE.	20000 max.	volts
GRID-No.2 VOLTAGE.	600 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value.	250 max.	volts
Positive-bias value.	0 max.	volts
Peak-positive value.	2 max.	volts
AVERAGE ULTOR CURRENT.	2 max.	ma
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 . . .	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts

■ ● ★ ▲: See next page. ◄ Indicates a change.

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

7NP4

PROJECTION KINESCOPE

Equipment Design Ranges:

With anultor voltage ($E_{c_4}k$) between 70000# and 80000 volts and grid-No.2 voltage ($E_{c_2}k$) between 400 and 600 volts

Grid-No.3 Voltage for focus.	20% to 22.6% of $E_{c_4}k$	volts
Grid-No.2 Voltage for visual extinction of focused raster when circuit design utilizes fixed grid-No.1 voltage ($E_{c_1}k$). . .	2.58 to 3.87 times $E_{c_1}k$	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level) to White-Level Value. . . .	Same value as fixed grid-No.1 voltage except video drive is a positive voltage.	
Grid-No.3 Current.	0 to +15	μa
Grid-No.2 Current.	-15 to +15	μa

Examples of Use of Design Ranges:

For ultor voltage of	*75000*	*volts*
Grid-No.3 Voltage for focus. . .	15000 to 17000	volts
Grid-No.2 Voltage for visual extinction of focused raster when circuit design utilizes fixed grid-No.1 voltage ($E_{c_1}k$) of -155 volts	400 to 600	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level) to White-Level Value.	155	volts

Maximum Circuit Values:

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

■ Cathode drive is the operating condition in which the video signal varies the cathode potential.

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

Brilliance and definition decrease with decreasing ultor-to-grid-No.1 voltage or ultor voltage. In general, the ultor-to-grid-No.1 voltage or the ultor voltage should not be less than 70,000 volts.

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

OPERATING CONSIDERATIONS

X-ray radiation is produced at the face of the 7NP4 when it is operated at its normal ultor voltage. These rays can constitute a health hazard unless the tube is adequately

→ Indicates a change.

7NP4

PROJECTION KINESCOPE

shielded. Make sure that the shielding provides the required protection against personal injury.

The *base pins* fit a Diheptal 14-contact socket. It should be designed to prevent corona between pin 9 and pin 4, pin 13, and any adjacent socket-assembly bolt. The usual commercially available Diheptal sockets do not meet this requirement. Socket contacts for pins 5, 6, 7, 8, 10, 11, 12, and 13 should be removed so that maximum insulation is provided for pin 9. The socket should be made of high-grade, low-leakage, arc-resistant insulating material adequate to withstand 20,000 volts between the contact for pin 9 and the contacts for pins 4 and 13. The socket should not be rigidly mounted; it should have flexible leads and be allowed to move freely.

The *ultor connection* is made to the Medium cap on the side of the bulb. The ultor connector should have a ball-type corona shield with a diameter of about 1-1/2 inches in order to prevent the formation of corona.

An *air-cooling system* is required to cool the face of the 7NP4. The system consists of a blower, such as Pilot No. 50747 or No. 50748*, and an air duct, having an outlet diameter of about 2 inches, directed perpendicularly onto the face of the tube. An air flow of 40 cubic feet per minute at the tube face is required to provide adequate cooling. 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 ultor 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.

Failure of scanning while the 7NP4 draws beam current may permanently damage the screen. Provision should be made, therefore, for automatic, high-speed cutoff of the beam current in case of scanning failure.

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

* Made by F.A. Smith Mfg. Co., Inc., P.O. Box 509, Rochester 2, N.Y.

7NP4

PROJECTION KINESCOPE

PRECAUTION

During storage of this Projection Kinescope, occluded gas may be released within the tube. When high voltage is applied, this gas may cause internal arcing with possible damage to the tube. To prevent such an occurrence, it is recommended that this kinescope be given the following treatment at intervals of about 2 months during storage, and at time of installation in equipment: With the beam cut off, apply normal ultor voltage to the tube. Gradually increase the ultor current in steps over a period of 15 minutes until one fourth of the operating ultor-current value is reached. Operate at this reduced value of current for 1 hour, and then increase the ultor current to full value for a few minutes before turning off the power.

OPERATING HINTS

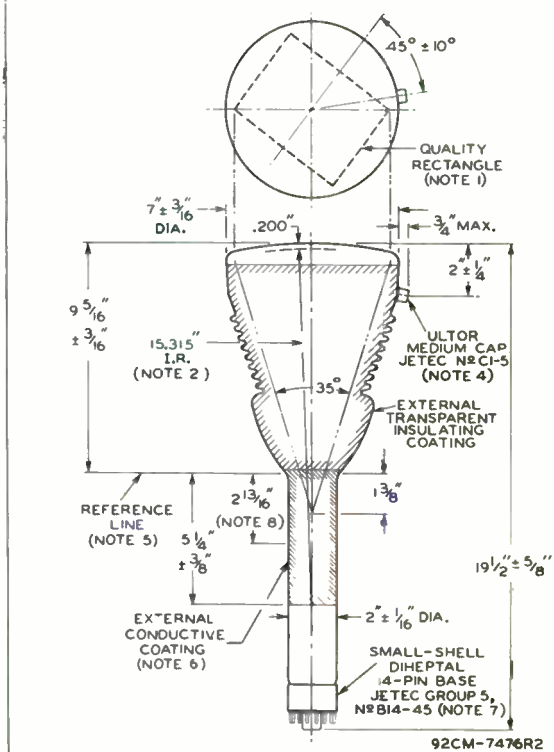
1. Never apply power input to the screen suddenly because immediate or delayed cracking of the face may result. Always increase or decrease the ultor current gradually.
2. Never exceed the maximum average ultor-current rating of 2 milliamperes.
3. Never overscan the screen because the beam will strike 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.

→ Indicates a change.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7NP4

PROJECTION KINESCOPE



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 ULTOR TERMINAL AND THE TUBE AXIS.

NOTE 2: INSIDE SURFACE OF FACEPLATE WITHIN THE QUALITY RECTANGLE MAY VARY ± 0.006" FROM THE SPHERICAL SURFACE HAVING A 15.315" RADIUS.

NOTE 3: INSIDE SURFACE OF FACEPLATE WITHIN THE QUALITY RECTANGLE MAY VARY ± 0.006" FROM THE SPHERICAL SURFACE HAVING A 20.3" RADIUS.

RCA

7NP4

PROJECTION KINESCOPE

NOTE 4: THE PLANE THROUGH BASE PIN 9 AND THE TUBE AXIS MAY VARY FROM THE PLANE THROUGH THE ULTOR TERMINAL AND THE TUBE AXIS BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. THE ULTOR TERMINAL IS ON SAME SIDE AS PIN 9.

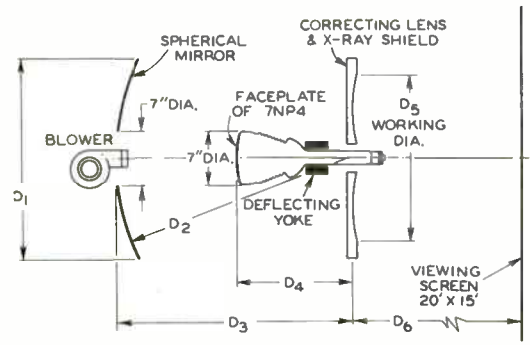
NOTE 5: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 2.100" ± 0.001" I.D. AND 3" LONG WILL REST ON BULB CONE.

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 9.

NOTE 8: EFFECTIVE DEFLECTING FIELD MUST BE WITHIN THIS SPACE.

TYPICAL REFLECTIVE OPTICAL SYSTEM



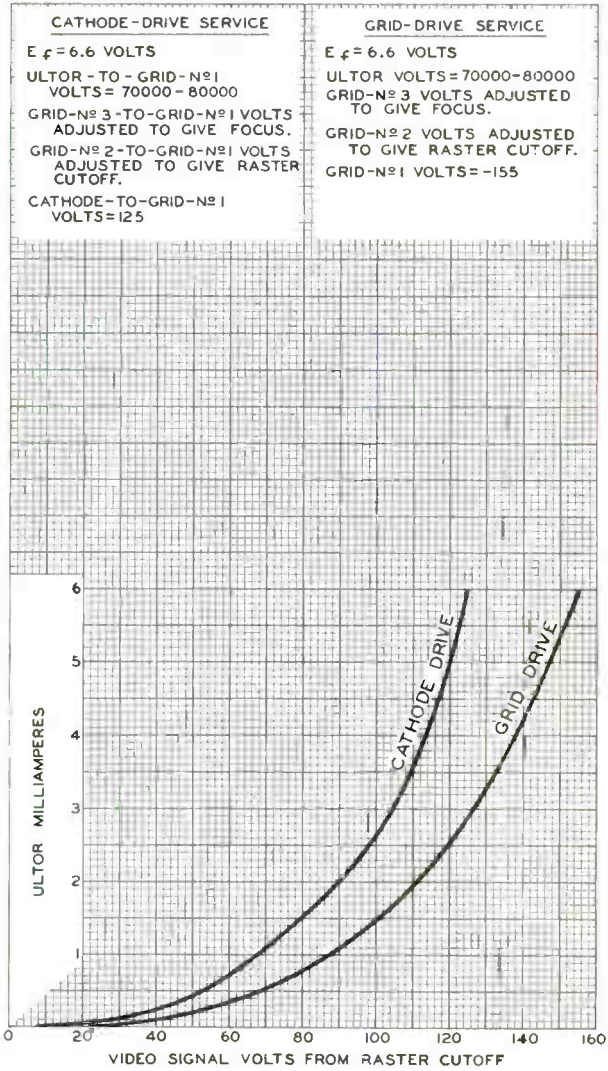
92CS-9763

DIMENSIONS (APPROX.)

D_1	26" Diameter
D_2	30" Radius
D_3	30"
D_4	15"
D_5	21.5"
D_6	60'

7NP4

AVERAGE DRIVE CHARACTERISTICS



RCA

7NP4

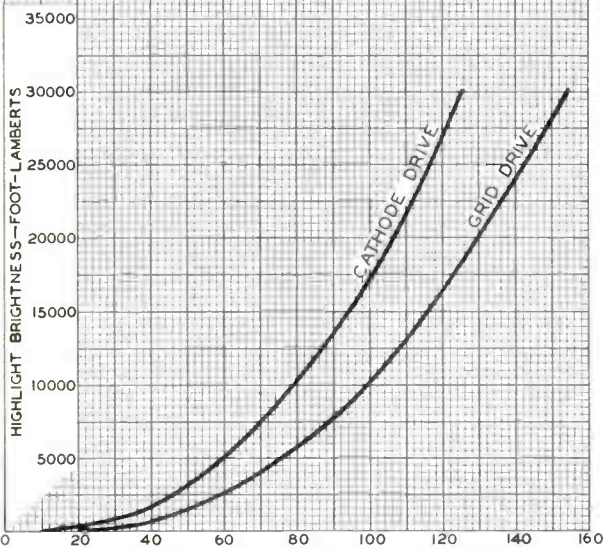
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE

E_f = 6.6 VOLTS
ULTOR-TO-GRID-Nº1 VOLTS = 75000
GRID-Nº3-TO-GRID-Nº1 VOLTS ADJUSTED TO GIVE FOCUS.
GRID-Nº2-TO-GRID-Nº1 VOLTS ADJUSTED TO GIVE RASTER CUTOFF.
CATHODE-TO-GRID-Nº1 VOLTS = 125
RASTER SIZE = 5" x 3 3/4"

GRID-DRIVE SERVICE

E_f = 6.6 VOLTS
ULTOR VOLTS = 75000
GRID-Nº3 VOLTS ADJUSTED TO GIVE FOCUS.
GRID-Nº2 VOLTS ADJUSTED TO GIVE RASTER CUTOFF.
GRID-Nº1 VOLTS = -155
RASTER SIZE = 5" x 3 3/4"

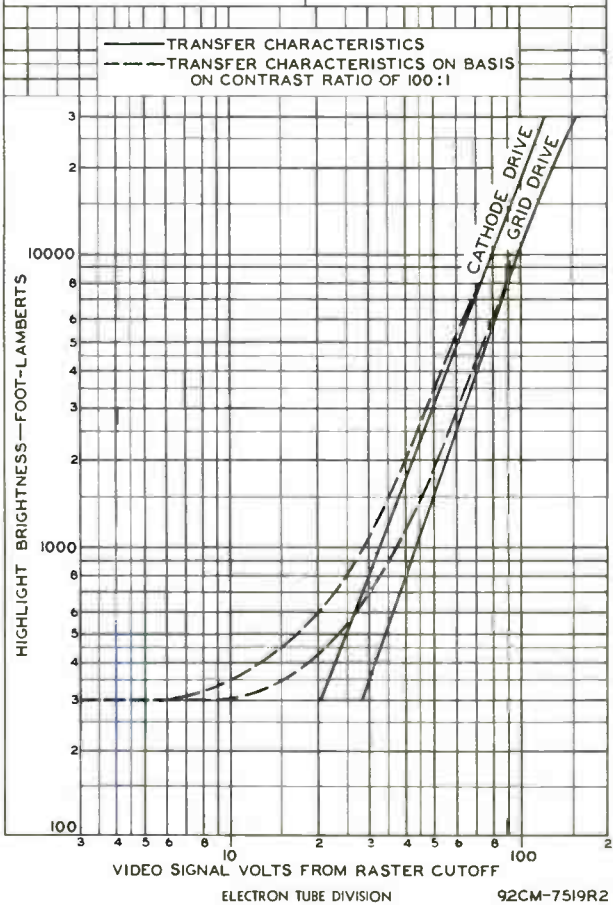


RCA

7NP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.6 VOLTS ULTOR-TO-GRID-№1 VOLTS = 75000 GRID-№3-TO-GRID-№1 VOLTS ADJUSTED TO GIVE FOCUS. GRID-№2-TO-GRID-№1 VOLTS ADJUSTED TO GIVE RASTER CUTOFF. CATHODE-TO-GRID-№1 VOLTS=125 RASTER SIZE = 5"x 3¾"	E_f = 6.6 VOLTS ULTOR VOLTS = 75000 GRID-№3 VOLTS ADJUSTED TO GIVE FOCUS. GRID-№2 VOLTS ADJUSTED TO GIVE RASTER CUTOFF. GRID-№1 VOLTS = -155 RASTER SIZE = 5"x 3¾"



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7519R2

7TP4
MONITOR KINESCOPE

METAL-BACKED SCREEN

ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

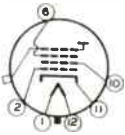
DATA

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	μμf
Cathode to All Other Electrodes	5	μμf
Faceplate		Clear Glass
Phosphor, Metal-Backed°		P4—Sulfide Type
Fluorescence and Phosphorescence		White
Persistence of Phosphorescence		Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angle (Approx.)		50°
Overall Length		13-1/8" ± 3/8"
Greatest Diameter of Bulb		7-3/16" ± 1/8"
Minumum Useful Screen Diameter		6"
Picture Size (within minimum-useful-screen area)		5-3/8" x 4"
Cap	Recessed Small Cavity (JETEC No. J1-21)	
Base	Small-Shell Duodecal 6-Pin (JETEC No. B6-63)	

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*:

ULTOR• VOLTAGE	12000 max. volts
GRID-No.3 VOLTAGE	2000 max. volts
GRID-No.2 VOLTAGE	410 max. volts
GRID-No.1 VOLTAGE:	
Negative bias value	125 max. volts
Positive bias value	0 max. volts
Positive peak value	2 max. volts

° For curves, see front of this Section.

• In the 7TP4, 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.

7TP4

7TP4
MONITOR KINESCOPE

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

Equipment Design Ranges:

For any ultor voltage (E_u) between 10000 and 12000 volts and grid-No.2 voltage (E_{c_2}) between 150 and 410 volts*

Grid-No.3 Voltage for Focus with Ultor Current of 100 μamp. . .	11.6% to 15.8% of E_u	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot.	11% to 25.7% of E_{c_2}	volts
Grid-No.3 Current**.	See Curves	
Grid-No.2 Current.	-15 to +15	μamp
Field Strength of Adjustable Centering Magnet.	0 to 8	gausses

Examples of Use of Design Ranges:

For ultor voltage of	*10000*	*volts*
and grid-No.2 voltage of	*200*	*volts*
Grid-No.3 Voltage for Focus with Ultor Current of 100 μamp . .	1160 to 1580	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-22 to -52	volts

Maximum Circuit Values:

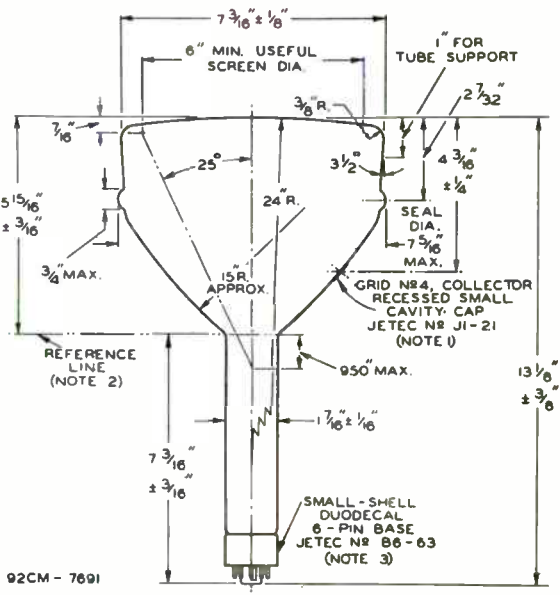
Grid-No.1-Circuit Resistance.	1.5 max.	megohms

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 10000 volts.

** Grid-No.3 current increases as the ultor voltage is decreased.

7TP4

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 ± 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.

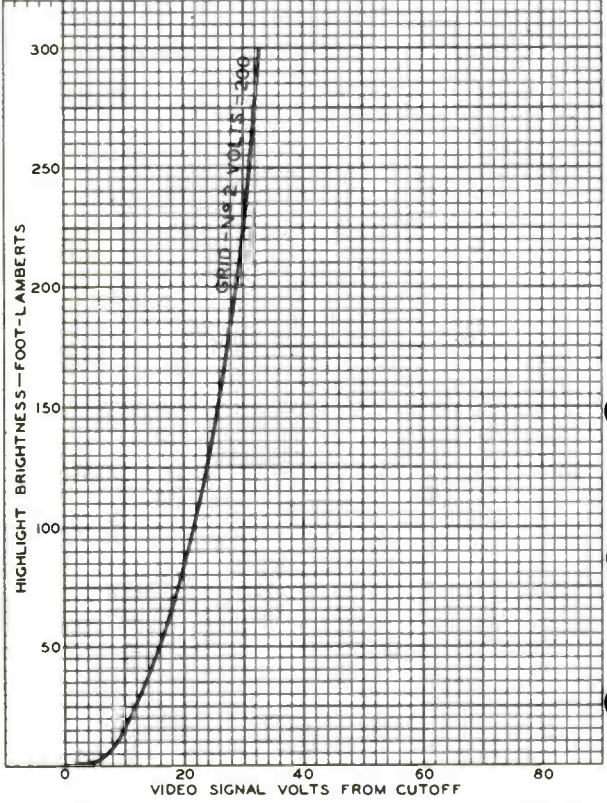
NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF 1-7/8".

RCA

7TP4

AVERAGE GRID-DRIVE CHARACTERISTICS

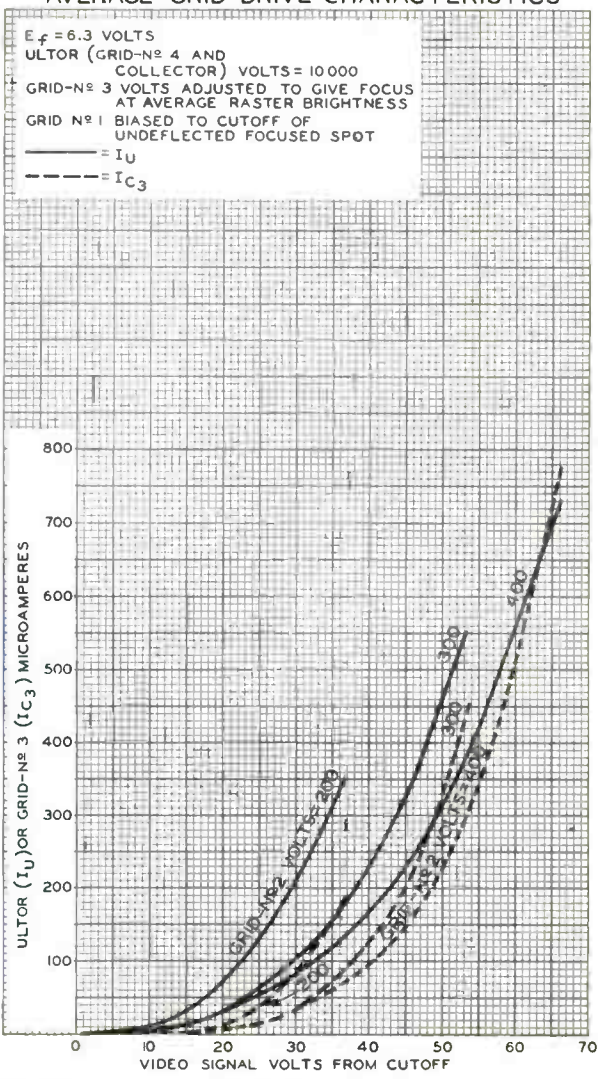
E_f = 6.3 VOLTS
ULTOR (GRID-№ 4 AND COLLECTOR) VOLTS = 10000
GRID-№ 3 VOLTS ADJUSTED TO GIVE FOCUS AT AVERAGE RASTER BRIGHTNESS
GRID № 1 BIASED TO CUTOFF OF UNDEFLECTED FOCUSED SPOT
RASTER SIZE = 5 3/8" X 4"



RCA

7TP4

AVERAGE GRID-DRIVE CHARACTERISTICS



7VP1

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.):		
Grid No.1 to All Other Electrodes	6	μμf
DJ_1 to DJ_2	3	μμf
DJ_3 to DJ_4	2	μμf
DJ_1 to All Other Electrodes	9	μμf
DJ_2 to All Other Electrodes	9	μμf
DJ_3 to All Other Electrodes	7	μμf
DJ_4 to All Other Electrodes	7	μμf
Faceplate		Clear Glass
Phosphor (For Curves, see front of this Section)		P1
Fluorescence and Phosphorescence		Green
Persistence of Phosphorescence		Medium
Focusing Method		Electrostatic
Deflection Method		Electrostatic
Overall Length		14-1/2" ± 3/8"
Greatest Diameter of Bulb		7" ± 1/8"
Minimum Useful Screen Diameter		6"
Mounting Position		Any
Bulb		J56H
Base	Medium-Shell Diheptal 12-Pin (JETEC No.B12-37)	

BOTTOM VIEW

Pin 1 – Heater
Pin 2 – Cathode
Pin 3 – Grid No.1
Pin 4 – No Connection
Pin 5 – Grid No.3
Pin 7 – Deflecting Electrode DJ_3
Pin 8 – Deflecting Electrode DJ_4
Pin 9 – Ultor● (Grid No.2, Grid No.4, Collector)
Pin 10 – Deflecting Elect. DJ_2
Pin 11 – Deflecting Elect. DJ_1
Pin 12 – Internal Connection – Do Not Use
Pin 14 – Heater

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 is deflected toward pin 5. With DJ_3 positive with respect to DJ_4, the spot is deflected toward pin 2.

The plane through the tube axis and pin 5 may vary from the trace produced by DJ_1 and DJ_2 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° ± 3°.

●: See next page.

7VP1

RCA

7VP1

OSCILLOGRAPH TUBE

Maximum Ratings, *Design-Center Values:*

ULTOR* VOLTAGE	4000 max.	volts
GRID-No.3 VOLTAGE	2000 max.	volts
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 ANY DEFLECTING ELECTRODE	750 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 (E_u) between 1000# and 4000 volts

Grid-No.3 Voltage for Focus	27% to 40% of E_u	volts
Maximum Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	2.8% of E_u	volts
Grid-No.3 Current	−15 to +10	μamp
Deflection Factors:		
DJ_1 & DJ_2	31 to 41	v dc/in./kv of E_u
DJ_3 & DJ_4	25 to 34	v dc/in./kv of E_u
Spot Position	##	

Examples of Use of Design Ranges:

For ultor voltage of	*1500*	*3000*	*volts*
Grid-No.3 Voltage for Focus	400 to 600	800 to 1200	volts
Maximum Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	−42	−84	volts
Deflection Factors:			
DJ_1 & DJ_2	47 to 62	93 to 123	volts dc/in.
DJ_3 & DJ_4	38 to 51	75 to 102	volts dc/in.

Maximum Circuit Values:

Grid No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting-Electrode Circuit°	5.0 max.	megohms

* In the 7VP1, grid No.4 which has the ultor function, grid No.2, 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.

#,##,°: See next page.

RCA

7VP1

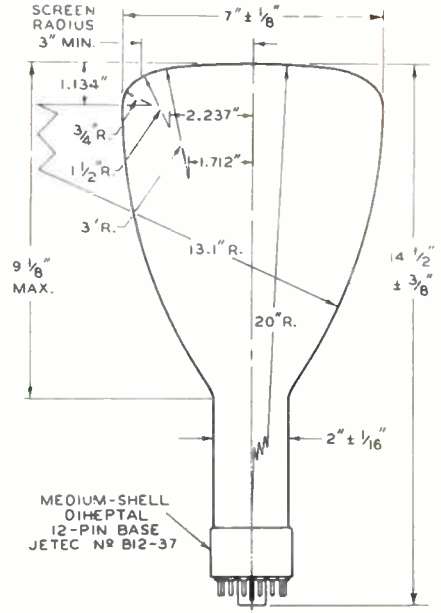
OSCILLOGRAPH TUBE

\# Brilliance and definition decrease with decreasing ultor voltage. A value as low as 1000 volts is recommended only for low-velocity deflection and low ambient-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 tube face.

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

The 7VP1 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-6667R1

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

RCA

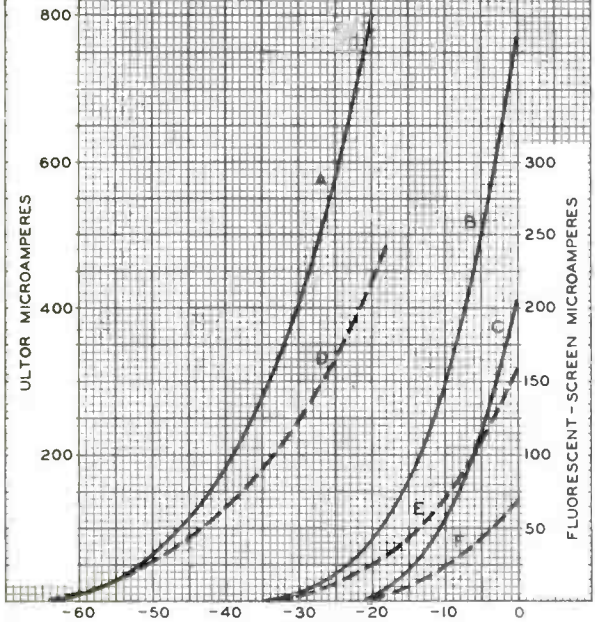
7VP1

AVERAGE CHARACTERISTICS

E_f = 6.3 VOLTS

GRID-Nº 3 VOLTS ADJUSTED FOR FOCUS

CURVE	CURRENT	ULTOR VOLTS
A	ULTOR	3000
B	ULTOR	1500
C	ULTOR	1000
D	FLUORESCENT SCREEN	3000
E	FLUORESCENT SCREEN	1500
F	FLUORESCENT SCREEN	1000



Oscillograph Tube

ELECTROSTATIC FOCUS
ELECTROSTATIC DEFLECTION

MEDIUM-SHORT-PERSISTENCE SCREEN
HIGH DEFLECTION SENSITIVITY

The 7VP31 is the same as the 7VP1 except for the following items:

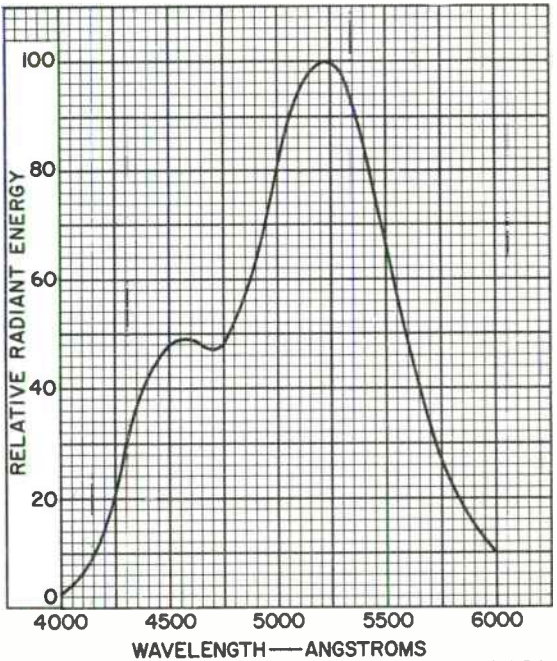
General:

Phosphor (See accompanying curves)	P31
Fluorescence	Green
Phosphorescence	Green
Persistence[a]	Medium Short[b] (Approx. 38 μsec)

[a] Time for initial brightness to decay to 10% point.

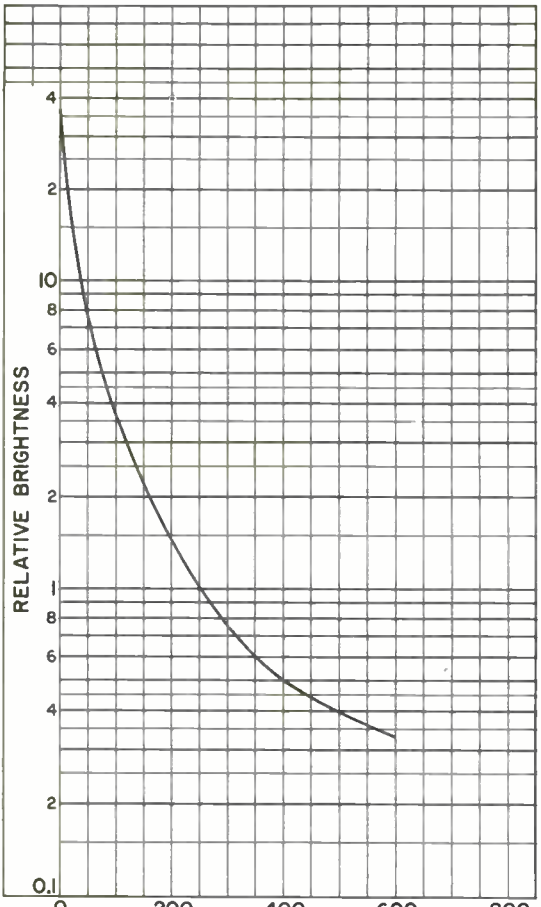
[b] Phosphorescence may have a useful brightness for over a minute under conditions of adequate excitation and low-ambient illumination.

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P31



92CM-11261

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P31



RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

7WP4

PROJECTION KINESCOPE

20' x 15' PICTURES

FORCED-AIR COOLED — ALUMINIZED SCREEN

ELECTROSTATIC FOCUS — MAGNETIC DEFLECT'ON

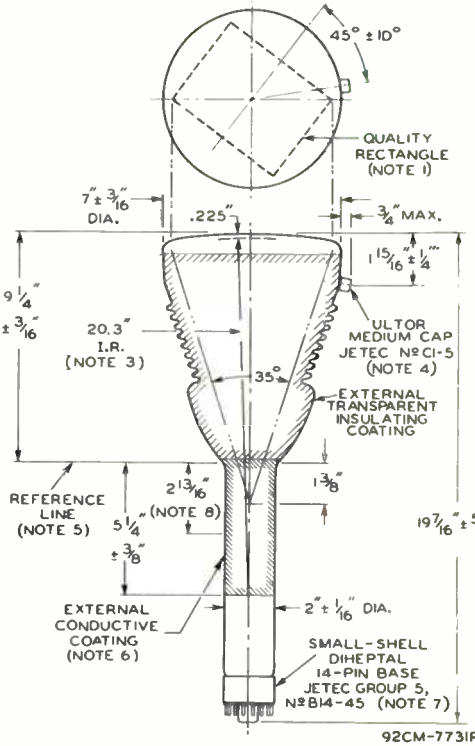
For use in theater-television equipment

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

General:

Projection Throw Distance for 20' x 15' Picture . . . 80 feet

Overall Length. . . . . 19-7/16" ± 5/8"



RCA

7WP4

PROJECTION KINESCOPE

NOTE 1: WHEN VIEWED FROM THE FACE OF THE TUBE, THE MINOR AXIS OF THE 5" x 3-3/4" QUALITY RECTANGLE IS LOCATED $45^{\circ} \pm 10^{\circ}$ IN A COUNTER-CLOCKWISE DIRECTION FROM A PLANE THROUGH THE ULTOR TERMINAL AND THE TUBE AXIS.

NOTE 2: INSIDE SURFACE OF FACEPLATE WITHIN THE QUALITY RECTANGLE MAY VARY ± 0.006" FROM THE SPHERICAL SURFACE HAVING A 15.315" RADIUS.

NOTE 3: INSIDE SURFACE OF FACEPLATE WITHIN THE QUALITY RECTANGLE MAY VARY ± 0.006" FROM THE SPHERICAL SURFACE HAVING A 20.3" RADIUS.

NOTE 4: THE PLANE THROUGH BASE PIN 9 AND THE TUBE AXIS MAY VARY FROM THE PLANE THROUGH THE ULTOR TERMINAL AND THE TUBE AXIS BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^{\circ}$. THE ULTOR TERMINAL IS ON SAME SIDE AS PIN 9.

NOTE 5: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 2.100" ± 0.001" I.D. AND 3" 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 9.

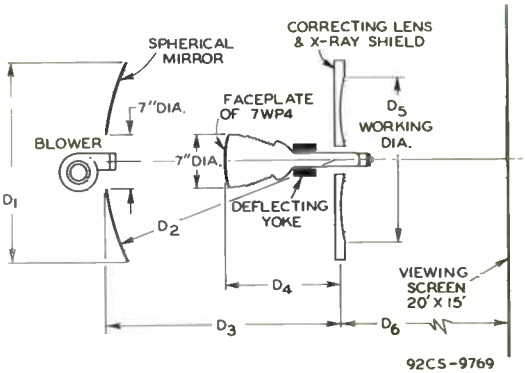
NOTE 8: EFFECTIVE DEFLECTING FIELD MUST BE WITHIN THIS SPACE.

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

7WP4

PROJECTION KINESCOPE

TYPICAL REFLECTIVE OPTICAL SYSTEM



DIMENSIONS (APPROX.)

D_1	27" Diameter
D_2	40" Radius
D_3	40'
D_4	20"
D_5	24.5"
D_6	80'

8DP4

PICTURE TUBE

SMALL, COMPACT, RECTANGULAR GLASS TYPE

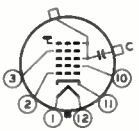
LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp
Capacitance between External Conductive Coating and Ultor	350 max. μμf 250 min. μμf
Faceplate, Spherical	Filterglass
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type
Deflection Angles (Approx.):	
Diagonal	90°
Horizontal	85°
Vertical	68°
Electron Gun	Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:	
Overall length	10-7/16" ± 5/16"
Greatest width	7-7/8" + 1/16" - 1/32"
Greatest height	5-1/16" + 1/16" - 1/32"
Diagonal	8-7/16" + 1/16" - 1/32"
Neck length	6-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)	27"
Screen Dimensions (Minimum):	
Greatest width	7-3/16"
Greatest height	5-3/8"
Diagonal	7-13/16"
Projected area	35.5 sq. in.
Operating Position	Any
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	12AB

Pin 1 – Heater
Pin 2 – Grid No.1
Pin 3 – 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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	8000 max. volts
GRID-No.4 (FOCUSING) VOLTAGE:	
Positive value	500 max. volts
Negative value	500 max. volts
GRID-No.2 VOLTAGE	300 max. volts

← Indicates a change.

8DP4

PICTURE TUBE

GRID-No.1 VOLTAGE:		
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

NO ION-TRAP MAGNET REQUIRED
RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **90° MAGNETIC DEFLECTION**

Electrical:

Direct Interelectrode Capacitances:		
Cathode to all other electrodes.	5	pf
Grid No.1 to all other electrodes.	9	pf
External conductive coating to anode . . .	350 max.	pf
	250 min.	pf
Heater Current at 6.3 volts.	600 ± 60	ma
Electron Gun	Type Requiring No Ion-Trap Magnet	

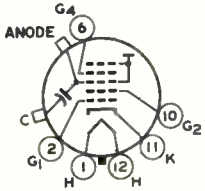
Optical:

Phosphor (For Curves, see front of this Section) . .	P4—Sulfide Type, Aluminized
Faceplate.	Filterglass
Light transmission (Approx.)	80%

Mechanical:

Weight (Approx.)	2.5 lbs
Overall Length	9.94" ± .31"
Neck Length.	6.00" ± .19"
Projecteo Area of Screen	36 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 J67-1/2A* sheets at front of this section	
Cap.	Recessed Small Cavity (JEDEC No.J1-21)
Base	Small-Shell Duodecal 6-Pin (JEDEC Group 4, B6-63)
Basing 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
Cap - Anode (Grid No.3, Grid No.5, Screen, Collector)
C - External Conductive Coating



Maximum and Minimum Ratings, *Absolute-Maximum Values:*

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

Anode Voltage	14000 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 peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
Heater Voltage	6.9 max. 5.7 min.	volts volts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Typical Operating Conditions for Grid-Drive Service:

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

Anode Voltage	11000	volts
Grid-No.4 Voltage	0 to 300	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

Monitor Kinescope

NO ION-TRAP MAGNET REQUIRED

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **90° MAGNETIC DEFLECTION**

Electrical:

Direct Interelectrode Capacitances:		
Cathode to all other electrodes	5	pf
Grid No.1 to all other electrodes	6	pf
Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

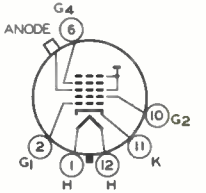
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate	Filterglass
Light transmission at center (Approx.)	80%

Mechanical:

Weight (Approx.)	2-1/2 lbs
Overall Length	9.75" ± .19"
Neck Length	5.81" ± .12"
Projected Area of Screen	36 sq.in.
External Conductive Coating	None

For Additional Information on Dimensions:
See *Bulb J67-1/2A* 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)
Basing Designation for BOTTOM VIEW 12M



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)

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

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

Anode Voltage	22000 max.	volts
Grid-No.4 Voltage:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
Grid-No.2 Voltage	550 max.	volts
	200 min.	volts
Grid-No.1 Voltage:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts

Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
Heater Voltage	6.9 max.	volts
	5.7 min.	volts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode:		
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	16000	volts
Grid-No.4 Voltage[a]	200	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

[a] The grid-No.4 voltage required for optimum focus of any individual tube will have a value anywhere between 0 to +400 volts.

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

Test Picture Tube

NO ION-TRAP MAGNET REQUIRED
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
ELECTROSTATIC SELF FOCUS — 90° MAGNETIC DEFLECTION

Electrical:

Direct Interelectrode Capacitances:		
Cathode to all other electrodes	5	pf
Grid No.1 to all other electrodes	6	pf
Heater Current at 6.3 volts	600	ma
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For Curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate	Filterglass
Light transmission (Approx.)	80%

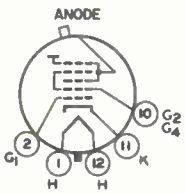
Mechanical:

Weight (Approx.)	3 lbs
Overall Length	11.44" ± .31"
Neck Length	7.50" ± .19"
Projected Area of Screen	36 sq. in.
External Conductive Coating	None

For Additional Information on Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J67-1/2A* sheets at Front of this section

Cap . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . . . . Small-Shell Duodecal 5-Pin (JEDEC Group 4, No.B5-57)
Basing Designation for BOTTOM VIEW 12S

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)



Maximum Ratings, *Design-Maximum Values:*

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

Anode Voltage	22000 max.	volts
Grid-No.2 and Grid-No.4 Voltage	550 max.	volts
Grid-No.1 Voltage:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 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 seconds	450 max.	volts
After equipment-warm-up period	200 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

Anode Voltage	16000	volts
Grid-No.2 and Grid-No.4 Voltage	400	volts
Cathode Voltage for visual extinction of focused raster	36 to 78	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

Test Picture Tube

NO ION-TRAP MAGNET REQUIRED

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
ELECTROSTATIC SELF FOCUS — **110° MAGNETIC DEFLECTION**

Electrical:

Direct Interelectrode Capacitances:		
Cathode to all other electrodes	4	pf
Grid No.1 to all other electrodes	6	pf
Heater Current at 6.3 volts	600	ma
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate	Filtergiass
Light transmission (Approx.)	80%

Mechanical:

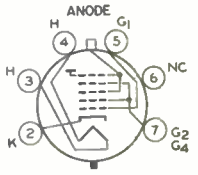
Weight (Approx.)	2 lbs
Overall Length	8.69" ± .31"
Neck Length	5.19" ± .19"
Projected Area of Screen	39 sq. in.
External Conductive Coating	None

For Additional Information on Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J67-1/2 B* sheets at front of this section

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

Bases (Alternates):
- Special 6-Pin (JEDEC No.B6-185)
- Special 6-Pin (JEDEC No.B6-214)
- Basing Designation for BOTTOM VIEW 7FG

Pin 2 – Cathode
Pin 3 – Heater
Pin 4 – Heater
Pin 5 – Grid No.1
Pin 6 – No Internal Connection
Pin 7 – Grid No.2, Grid No.4
Cap – Anode (Grid No.3, Grid No.5, Screen, Collector)



Maximum Ratings, *Design-Maximum Values:*

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

Anode Voltage	22000	volts
Grid-No.2 and Grid-No.4 Voltage	550	volts
Grid-No.1 Voltage:		
Negative peak value	220	volts
Negative bias value	155	volts
Positive bias value	0	volts
Positive peak value	2	volts

Peak Heater-Cathode Voltage:
Heater negative with respect to cathode:
During equipment warm-up period not exceeding 15 seconds . . . . . 450 volts
After equipment-warm-up period . . . . . 200 volts
Heater positive with respect to cathode . . . 200 volts

Typical Operating Conditions for Cathode-Drive Service:

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

Anode Voltage . . . . . 16000 volts
Grid-No. 2 and Grid-No. 4 Voltage . . . . . 400 volts
Cathode Voltage for visual extinction of focused raster . . . . . 42 to 78 volts

Maximum Circuit Value:

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

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

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

10BP4-A
PICTURE TUBE

ROUND GLASS TYPE

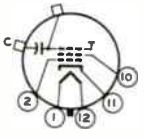
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp ←
Capacitance between External Conductive Coating and Ultor	2500 max. / 500 min.	μμf ← / μμf ←
Faceplate, Spherical		Filter Glass
Phosphor (For curves, see front of this section)		P4—Sulfide Type
Deflection Angle (Approx.)		50° ←
Electron Gun		Ion-Trap Type Requiring External Single-Field Magnet
Overall Length		17-5/8" ± 3/8"
Greatest Diameter of Bulb		10-1/2" ± 1/8"
Minimum Useful Screen Diameter		9-1/8" ←
Operating Position		Any
Cap		Recessed Small Cavity (JETEC No. J1-21) ←
Base . . Small-Shell Duodecal 5-Pin (JETEC Group 4, No. B5-57)		←
Basing Designation for BOTTOM VIEW		12N ←

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



Cap▲ – Ultor (Grid No.3, Collector)
C – External Conductive Coating

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

ULTOR VOLTAGE	12000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 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 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts ←
Heater positive with respect to cathode	150 max.	volts ←

Maximum Circuit Values:

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

▲ Cap may be aligned with either vacant pin position 6 or vacant pin position 3.

← Indicates a change.

10FP4-A
PICTURE TUBE

ROUND GLASS TYPE
MAGNETIC FOCUS

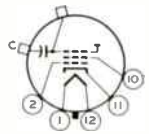
ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp ←
Capacitance between External Conductive Coating and Ultor	2500 max. μμf 500 min. μμf
Faceplate, Spherical	Filterglass
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized
Deflection Angle (Approx.)	50°
Electron Gun	Type Requiring No Ion-Trap Magnet
Overall Length	17-5/8" ± 3/8"
Greatest Diameter of Bulb	10-1/2" ± 1/16" ←
Minimum Useful Screen Diameter	9-1/8"
Operating Position	Any
Cap	Recessed Small Cavity (JETEC No. J1-21)
Base	Small-Shell Duodecal 5-Pin (JETEC Group 4, No. B5-57) ←
Basing Designation for BOTTOM VIEW	12N ←

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



Cap▲ – Ultor (Grid No.3, Collector)
C – External Conductive Coating

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	12000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 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 seconds	410 max.	volts
After equipment warm-up period	140 max.	volts
Heater positive with respect to cathode	140 max.	volts

Maximum Circuit Values:

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

▲ Cap may be aligned with either vacant pin position 6 or vacant pin position 3.

← Indicates a change.

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

RCA

10SP4

MONITOR KINESCOPE

METAL-BACKED SCREEN

ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

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 μμf
Cathode to All Other Electrodes	5 μμf
Faceplate, Spherical	Filterglass
Light Transmission (Approx.)	66%
Phosphor°, Metal-Backed	P4—Sulfide Type
Fluorescence and Phosphorescence	White
Persistence of Phosphorescence	Short
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle (Approx.)	50°
Overall Length	16-5/8" ± 3/8"
Greatest Diameter of Bulb	10-1/2" ± 1/8"
Minimum Useful Screen Diameter	9-1/8"
Picture Size (Within minimum-useful-screen area)	8" x 6"
Mounting Position	Any
Cap	Recessed Small Cavity (JETEC No. J1-21)
Base	Small-Shell Duodecal 6-Pin (JETEC No. B6-63)

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 – Ultor (Grid No.4 & Collector)

Maximum Ratings, *Design-Center Values*:

ULTOR• VOLTAGE	14000 max.	volts
GRID-No.3 VOLTAGE	2700 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts

° For curves, see front of this Section.

• In the 10SP4, 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.

RCA

10SP4

MONITOR KINESCOPE

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

Equipment Design Ranges:

For any ultor voltage (E_u) between 10000 and 14000 volts and grid-No.2 voltage (E_{c_2}) between 150 and 410 volts*

Grid-No.3 Voltage for Focus with Ultor Current of 100 μamp	11.7% to 15.9% of E_u	volts
Grid-No.1 Voltage for Visual Extinction of 8" x 6" Raster	9% to 24% of E_{c_2}	volts
Max. Grid-No.3 Current**	See Curves	
Grid-No.2 Current	−15 to +15	μamp
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

For ultor voltage of	*12000*	*14000*	*volts*
and grid-No.2 voltage of	*200*	*200*	*volts*
Grid-No.3 Voltage for Focus with Ultor Current of 100 μamp	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

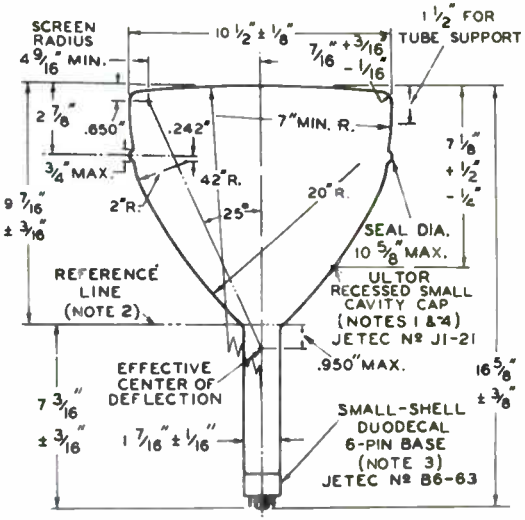
* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 10000 volts.

** Grid-No.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

10SP4

MONITOR KINESCOPE



92CM-7729

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 ±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.1112) 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".

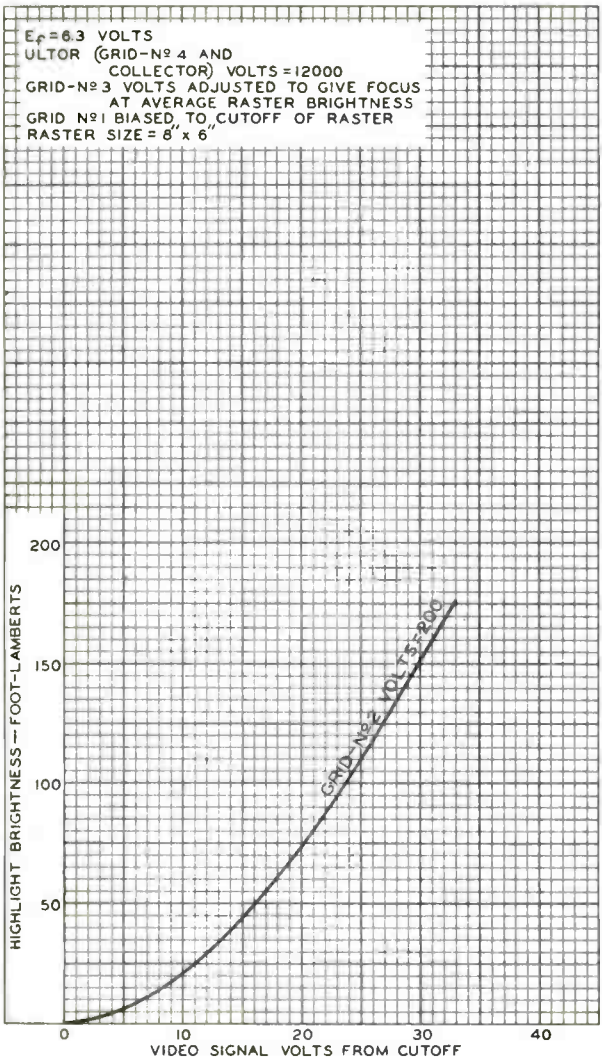
NOTE 4: TUBE SUPPORT MUST BE KEPT AT LEAST 2" AWAY FROM BULB TERMINAL.

10SP4

RCA

10SP4

AVERAGE GRID-DRIVE CHARACTERISTIC



MAR. 21, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

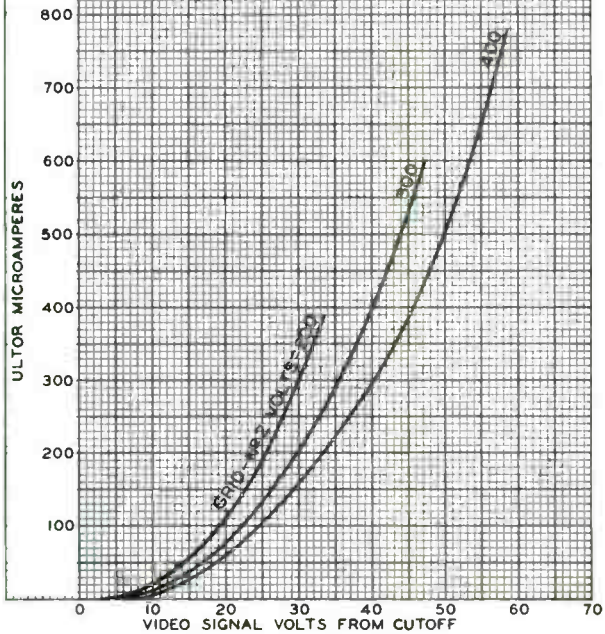
92CM-7774

RCA

10SP4

AVERAGE GRID-DRIVE CHARACTERISTICS

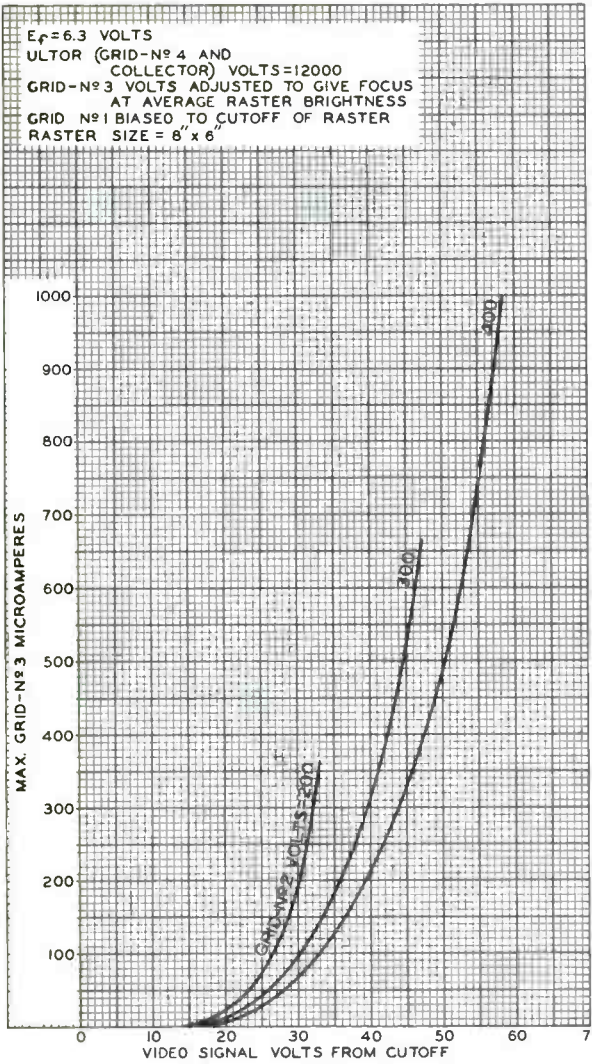
E_f = 6.3 VOLTS
ULTOR (GRID-№4 AND COLLECTOR) VOLTS = 12000
GRID-№3 VOLTS ADJUSTED TO GIVE FOCUS AT AVERAGE RASTER BRIGHTNESS
GRID №1 BIASED TO CUTOFF OF RASTER
RASTER SIZE = 8" x 6"



RCA

10SP4

GRID-DRIVE CHARACTERISTICS



Picture Tube

PAN-O-PLY TYPE
110° MAGNETIC DEFLECTION — LOW-VOLTAGE ELECTROSTATIC FOCUS

Direct Interelectrode Capacitances		
Cathode to all other electrodes	5	pF
Grid No.1 to all other electrodes	6	pF
External conductive coating to anode	500 min—750 max	pF
Heater Current at 6.3 V	450 ± 20	mA
Heater Warm-Up Time (Average)	11	s
Electron Gun	Type Requiring No Ion-Trap Magnet	

OPTICAL

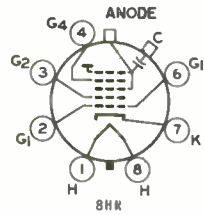
Phosphor	P4—Sulfide Type, Aluminized
For curves, see front of this section	
Faceplate	Filterglass
Light transmission at center (approx.)	79%

MECHANICAL

Weight (Approx.)	4 lb
Overall Length	8.785 ± .250 in
Neck Length	4.125 ± .125 in
Projected Area of Screen	60 sq in
External Conductive Coating[a]	
Type (See CRT OUTLINES at front of this section)	Regular-Band
Contact area for grounding	Near Reference Line
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Base	Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)

TERMINAL DIAGRAM (Bottom View)

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 AND DESIGN-MAXIMUM RATINGS, DESIGN-MAXIMUM VALUES

Voltages are positive with respect to cathode

Anode Voltage	8000 min—15000 max	V
Grid-No.4 Voltage		
Positive value	1100 max	V
Negative value	550 max	V
Grid-No.2 Voltage	200 min—550 max	V
Grid-No.1 Voltage		
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	5.7 min—6.9 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:	
Combined AC & DC voltage	200 max V
DC component	100 max V

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	400 V
Grid-No.1 Voltage	-39 to -94 V
For visual extinction of focused raster	

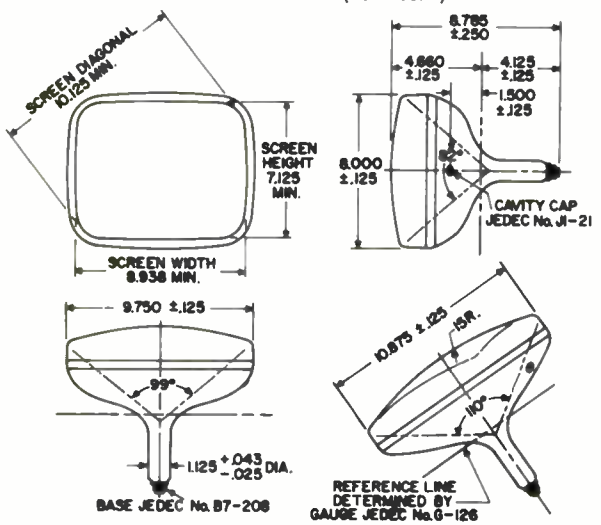
MAXIMUM CIRCUIT VALUE

Grid-No.1 Circuit Resistance	1.5 max MΩ

[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)



92CS-14055

DIMENSIONS IN INCHES

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

11HP4A

Picture Tube

PAN-O-PLY TYPE
110° MAGNETIC DEFLECTION — LOW-VOLTAGE ELECTROSTATIC FOCUS

Direct Interelectrode Capacitances		
Cathode to all other electrodes	5	pF
Grid No.1 to all other electrodes	6	pF
External conductive coating to anode	500 min—750 max	pF
Heater Current at 6.3 V.	450 ± 20	mA
Heater Warm-Up Time (Average).	11	s
Electron Gun	Type Requiring No Ion-Trap Magnet	

OPTICAL

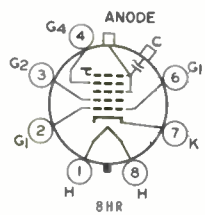
Phosphor	P4—Sulfide Type, Aluminized
For curves, see front of this section	
Faceplate	Filterglass
Light transmission at center (approx.)	52%

MECHANICAL

Weight (Approx.)	4 lb
Overall Length	8.785 ± .250 in
Neck Length	4.125 ± .125 in
Projected Area of Screen	60 sq in
External Conductive Coating[a]	
Type (See CRT OUTLINES at front of this section)	Regular-Band
Contact area for grounding	Near Reference Line
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Base	Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)

TERMINAL DIAGRAM (Bottom View)

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 AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES

Voltages are positive with respect to cathode

Anode Voltage	9000 min—15000 max	V
Grid-No.4 Voltage		
Positive value	1100 max	V
Negative value	550 max	V
Grid-No.2 Voltage	100 min—250 max	V
Grid-No.1 Voltage		
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	5.7 min—6.9 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:	
Combined AC & DC voltage	200 max V
DC component	100 max V

TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE

Voltages are positive with respect to grid No.1

Anode Voltage	11000 V
Grid-No.4 Voltage	0 V
Grid-No.2 Voltage	150 V
Cathode Voltage	31 to 49 V
For visual extinction of focused raster	

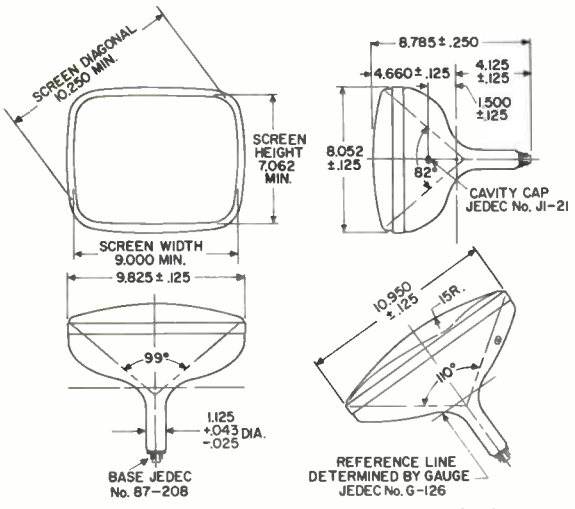
MAXIMUM CIRCUIT VALUE

Grid-No.1 Circuit Resistance	1.5 max MΩ

[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 J87B)



DIMENSIONS IN INCHES

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

12KP4-A
PICTURE TUBE

ROUND GLASS TYPE
MAGNETIC FOCUS

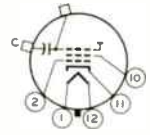
ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp ←
Capacitance between External Conductive Coating and Ultor	2500 max. 500 min.	μμf μμf
Faceplate, Spherical	Filterglass	
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized	
Deflection Angle (Approx.)	54°	
Electron Gun	Type Requiring No Ion-Trap Magnet	
Overall Length	17-5/8" ± 3/8"	
Greatest Diameter of Bulb	12-7/16" ± 1/16" ←	
Minimum Useful Screen Diameter	11-1/8" ←	
Operating Position	Any	
Cap	Recessed Small Cavity (JETEC No. J1-21)	
Base . . Small-Shell Duodecal 5-Pin (JETEC Group 4, No. B5-57) ←		
Basing Designation for BOTTOM VIEW	12N ←	

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



Cap▲ – Ultor (Grid No.3, Collector)
C – External Conductive Coating

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	12000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 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 seconds	410 max.	volts
After equipment warm-up period	140 max.	volts
Heater positive with respect to cathode	140 max.	volts

Maximum Circuit Values:

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

▲ Cap may be aligned with either vacant pin position 6 or vacant pin position 3.

← Indicates a change.

14ATP4

PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

Intended for use in equipment having series heater-string arrangement

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	8.4	ac or dc volts
Current	0.45	amp
Warm-up time (Average)	11	sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of Receiving Tube Section.

Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	1000 max.	μμf
	500 min.	μμf
Faceplate, Spherical	Filterglass	
Light transmission (Approx.)	78%	
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized	
Fluorescence	White	
Phosphorescence	White	
Persistence	Short	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	90°	
Horizontal	85°	
Vertical	68°	
Electron Gun	Type Requiring No Ion-Trap Magnet	
Tube Dimensions:		
Overall length	13-3/16" ± 5/16"	
Greatest width	13-1/16" ± 1/8"	
Greatest height	10-9/16" ± 1/8"	
Diagonal	14" ± 1/8"	
Neck length	5-1/2" ± 3/16"	
Screen Dimensions (Minimum):		
Greatest width	12-1/16"	
Greatest height	9-1/2"	
Diagonal	13"	
Projected area	104 sq. in.	
Weight (Approx.)	8.5 lbs	
Mounting Position	Any	
Cap	Recessed Small Cavity (JETEC No.J1-21)	
Bulb	J112 (90°)	
Base	Small-Shell Duodecal 6-Pin (JETEC No.B6-63)	

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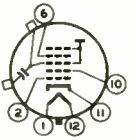
14ATP4

PICTURE TUBE

Basing 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



Cap – Ultor (Grid 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 Ratings, *Design-Center Values:*

ULTOR VOLTAGE	14000 max. 8000 min.	volts volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	200 max.	volts
Negative bias value	140 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

Equipment Design Ranges:

With any ultor voltage (E_{c_3k}) between 8000 and 14000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for Focus§	0 to 400	volts
Grid-No.1 Voltage (E_{c_1k}) for Visual Extinction of Focused Raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

▲ Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

§,*: See next page.

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14ATP4

PICTURE TUBE

Examples of Use of Design Ranges:

With ultor voltage of / *and grid-No.2 voltage of*	*10000* / *300*	*14000* / *400*	*volts* / *volts*
Grid-No.4 Voltage for Focus	0 to 400	0 to 400	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-25 to -69	-31 to -90	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	25 to 69	31 to 90	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 Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	14000 max. 8000 min.	volts volts
GRID-No.4-TO-GRID-No.1 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	140 max.	volts
Negative bias value	0 max.	volts
Negative 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

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_2g_1}$) between 8000 and 14000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 225 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for Focus§	0 to 400	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-to-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.

■ 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.

*: See next page.

14ATP4

PICTURE TUBE

Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for Visual Extinction of Focused Raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*		
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage		
Grid-No.4 Current	−25 to +25		μa
Grid-No.2 Current	−15 to +15		μa
Field Strength of Adjustable Centering Magnet*	0 to 8		gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*10000*	*14000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for Focus	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster.	25 to 58	31 to 75	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	−25 to −58	−31 to −75	volts

Maximum Circuit Values:

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

* 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 1/4-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 7/16-inch deflection of the spot from the center of the tube face.

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

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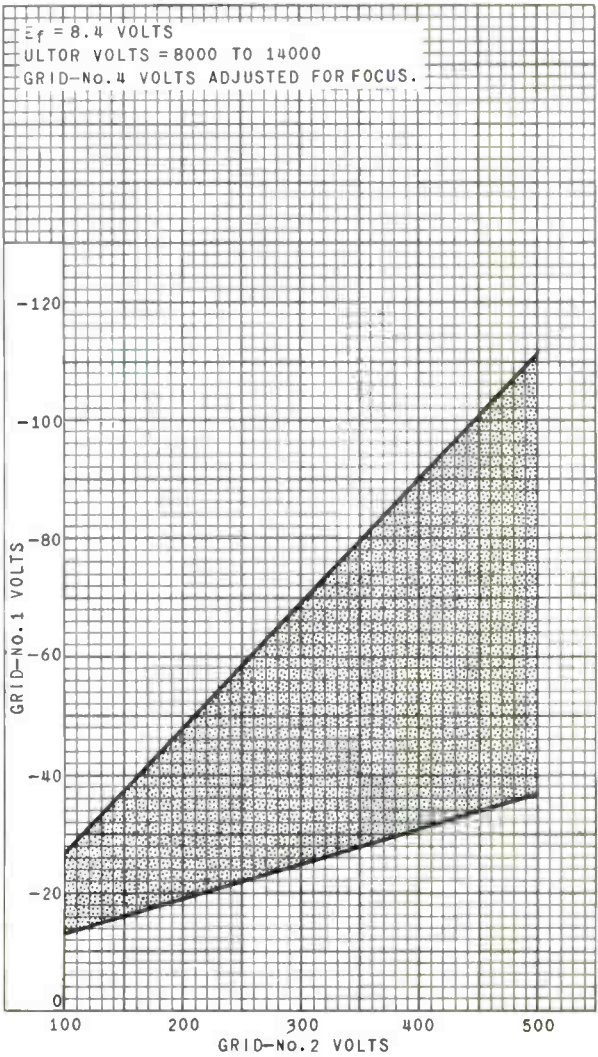
RCA

14ATP4

RASTER-CUTOFF-RANGE CHART

For Grid-Drive Service



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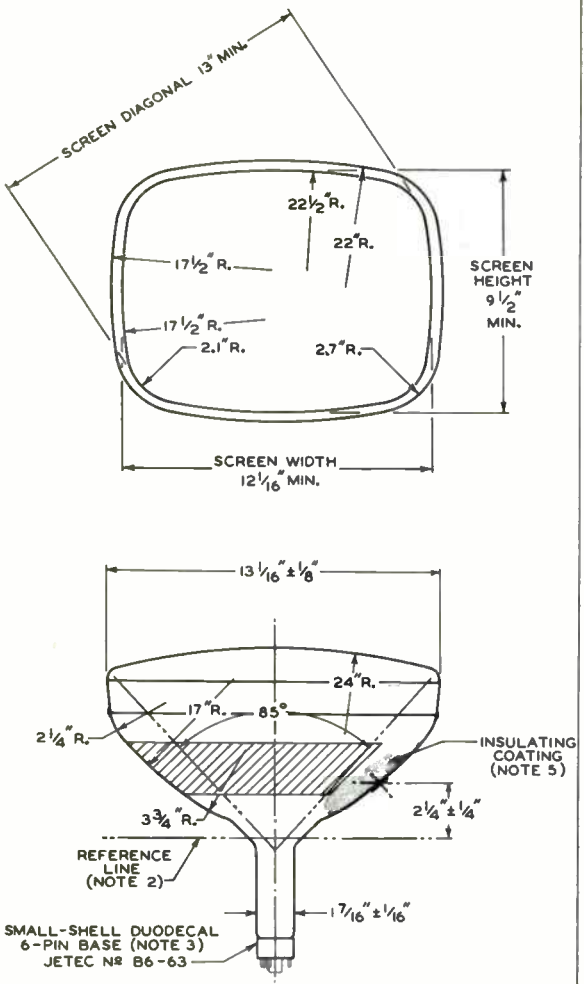
92CS-9275

14ATP4
PICTURE TUBE



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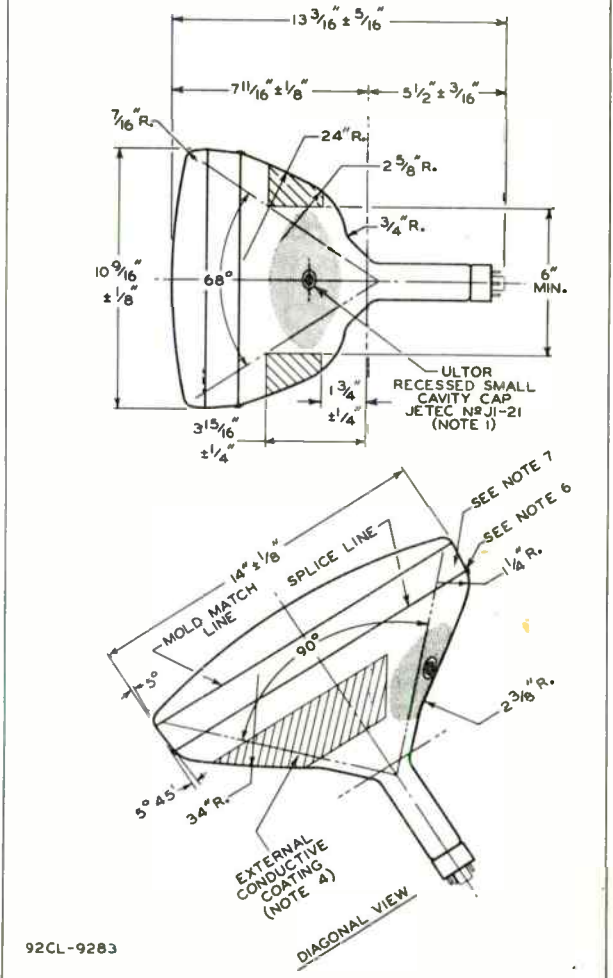
14ATP4

PICTURE TUBE



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14ATP4

PICTURE TUBE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND BULB TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. BULB TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH THE TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No. 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: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: BULGE AT SPLICE-LINE SEAL WILL NOT PROTRUDE BEYOND THE MAXIMUM INDICATED VALUE FOR ENVELOPE WIDTH, DIAGONAL, OR HEIGHT.

NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

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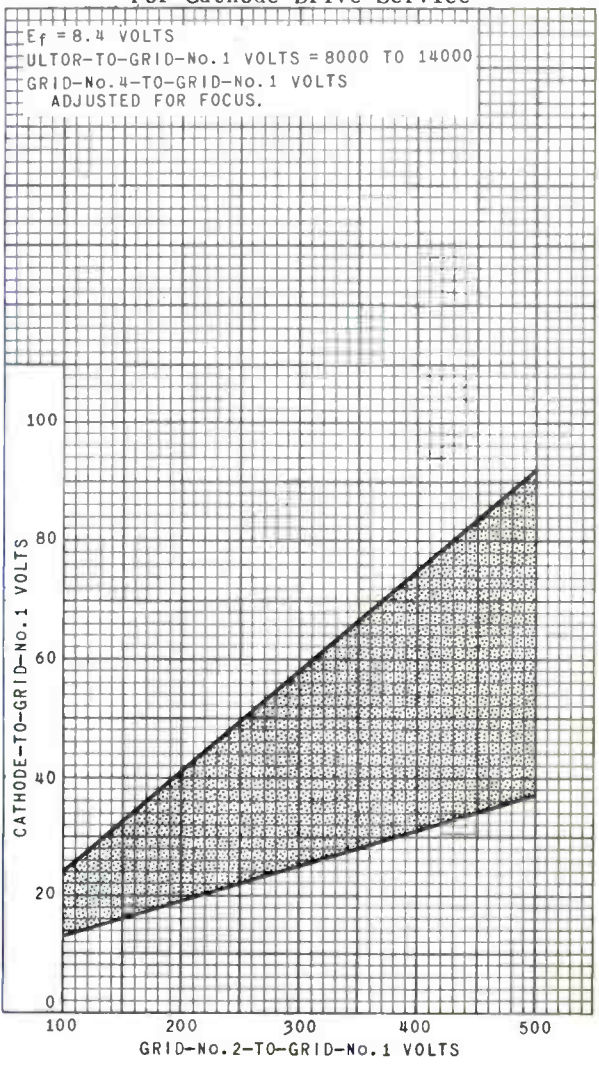
RCA

14ATP4

RASTER-CUTOFF-RANGE CHART

For Cathode-Drive Service

E_f = 8.4 VOLTS
ULTOR-TO-GRID-No.1 VOLTS = 8000 TO 14000
GRID-No.4-TO-GRID-No.1 VOLTS
ADJUSTED FOR FOCUS.



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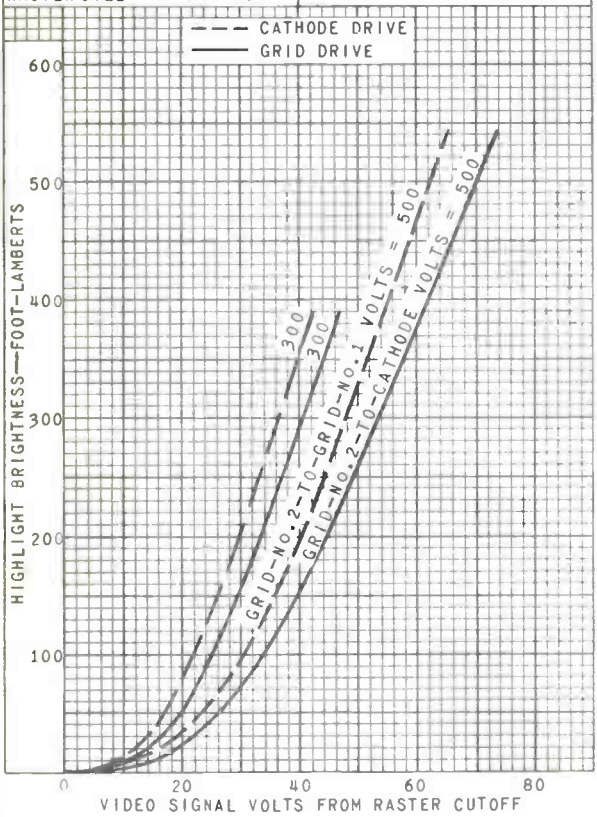
92CS-9276

RCA

14ATP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 8.4 VOLTS	E_f = 8.4 VOLTS
ULTOR-TO-GRID-No.1 VOLTS = 14000	ULTOR VOLTS = 14000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF.	GRID-No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 11" x 8-1/4"	RASTER SIZE = 11" x 8-1/4"

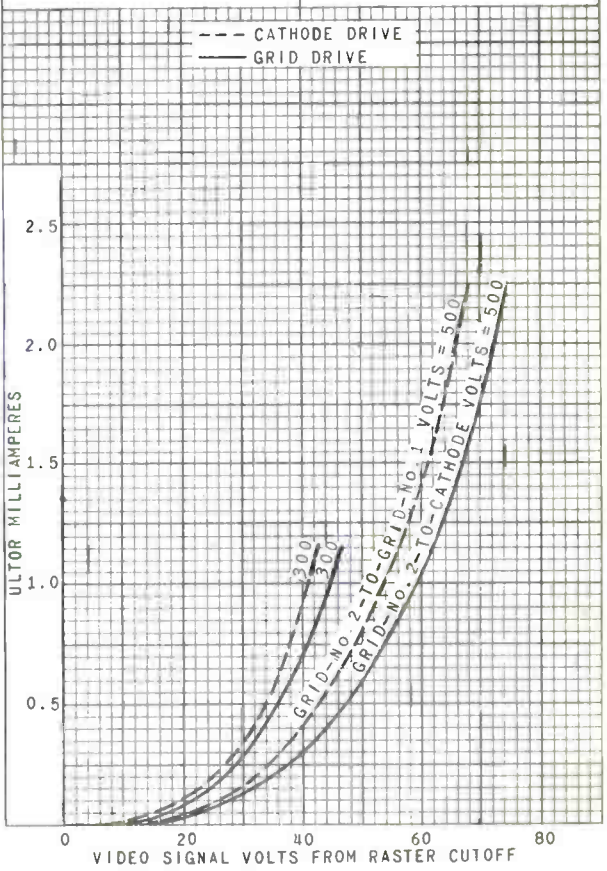


RCA

14ATP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 8.4 VOLTS ULTOR-TO-GRID-No.1 VOLTS = 8000 TO 14000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 8.4 VOLTS ULTOR VOLTS = 8000 TO 14000 GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



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14BAP4

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **70° MAGNETIC DEFLECTION**

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 10%	ma
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6.5	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	1000 max. / 600 min.	μμf
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Faceplate	Filterglass
Light transmission (Approx.)	76%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type, Aluminized

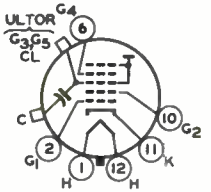
Mechanical:

Operating Position	Any
Weight (Approx.)	10 lbs
Overall Length	16-25/32" ± 3/8"
Neck Length	7-1/2" ± 3/16"
Projected Area of Screen	96 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 J109-1/2 A/C* sheets at the front of this section

Cap. . . . . Recessed Small Cavity (JEDEC No.J1-21)
Small-Shell Duodecal 6-Pin,
Arrangement 1 (JEDEC Group 4, No.B6-63)

Basing 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

Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

Maximum Ratings, ***Design-Maximum Values:***

ULTOR VOLTAGE	22000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	800 max.	volts
GRID-No.2 VOLTAGE	700 max.	volts

GRID-No.1 VOLTAGE:		
Negative bias value	180 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts

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

14HP4

PICTURE TUBE

RECTANGULAR GLASS TYPE

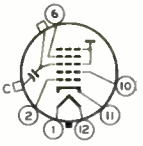
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp
Capacitance between External Conductive Coating and Ultor	2000 max. μμf; 750 min. μμf
Faceplate, Spherical	Filterglass
Phosphor (For curves, see front of this Section)	P4—Sulfide Type
Deflection Angles (Approx.):	
Diagonal	70°
Horizontal	65°
Vertical	50°
Electron Gun	Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:	
Overall length	16-25/32" ± 3/8"
Greatest width	12-17/32" ± 1/8"
Greatest height	9-23/32" ± 1/8"
Diagonal	13-11/16" ± 1/8"
Neck length	7-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)	27"
Screen Dimensions (Minimum):	
Greatest width	11-1/2"
Greatest height	8-5/8"
Diagonal	12-3/4"
Projected area	96 sq. in.
Operating Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Base	Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-63)
Basing 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



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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	14000 max. volts
GRID-No.4 (FOCUSING) VOLTAGE:	
Positive value	500 max. volts
Negative value	500 max. volts
GRID-No.2 VOLTAGE	500 max. volts

←Indicates a change.

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14HP4

PICTURE TUBE

GRID-No.1 VOLTAGE:		
Negative-bias value.	125 max.	volts
Positive-bias value.	0 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 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

ELECTRON TUBE DIVISION
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Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **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	6	pf
External conductive coating to anode	1200 max. / 800 min.	pf / pf
Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

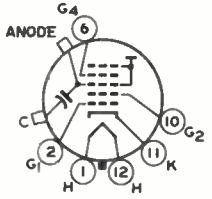
Optical:

Phosphor (For curves, see front of this section). P4—Sulfide Type, Aluminized
Faceplate, Spherical. . . . . Filterglass
Light transmission (Approx.). 78%

Mechanical:

Weight (Approx.). . . . . 8.5 lbs
Overall Length. . . . . 13-3/16" ± 5/16"
Neck Length . . . . . 5-1/2" ± 3/16"
Projected Area of Screen. . . . . 104 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 J112A/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)
Basing 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



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 values are positive with respect to cathode

ANODE VOLTAGE	15500 max. 9000 min.	volts 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 peak value	220 max.	volts
Negative bias value	200 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts 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	12000	volts
Grid-No.4 Voltage	-50 to + 350	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

14RP4

PICTURE TUBE

SHORT RECTANGULAR GLASS TYPE

LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

The 14RP4 is the same as the 14RP4-A except that it utilizes a *non-aluminized phosphor.*

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14RP4-A
PICTURE TUBE

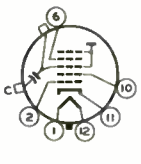
SHORT RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc 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	1200 max. 800 min.	μμf ← μμf ←
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		78%
Phosphor (For Curves, see front of this Section)		P4—Sulfide Type Aluminized
Fluorescence		White
Phosphorescence		White
Persistence		Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		90°
Horizontal		85°
Vertical		68°
Electron Gun		Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:		
Overall length		14-3/16" ± 5/16" ←
Greatest width		13-1/16" ± 1/8"
Greatest height		10-9/16" ± 1/8"
Diagonal		14" ± 1/8"
Neck length		6-1/2" ± 3/16" ←
Screen Dimensions (Minimum):		
Greatest width		12-1/16" ←
Greatest height		9-1/2" ←
Diagonal		13" ←
Projected area		104 sq. in.
Weight (Approx.)		8.5 lbs
Operating Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Bulb		J112
Base		Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-63)
Basing 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



Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

← Indicates a change.

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14RP4-A

PICTURE TUBE

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	14000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	500 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	400 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	160 max.	volts
Negative-bias value	110 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

Equipment Design Ranges:

With any ultor voltage (E_{c_5k}) between 8000# and 14000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 400 volts

Grid-No.4 Voltage required for focus:
- Changes directly with E_{c_5k} at the rate of approximately 30 volts for each 1000-volt change in E_{c_5k}.
- Changes inversely with E_{c_5k} at the rate of approximately 10 volts for each 100-volt change in E_{c_2k}.
- Changes inversely with ultor current at the rate of approximately 25 volts for each 50-μa change in ultor current.

For typical values, see *Examples of Use of Design Ranges.*

Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is positive voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Ion-Trap Magnet Current (Average)**	$\sqrt{E_{c_5k}/14000} \times 38$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{E_{c_5k}/14000} \times 43$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

▲,#,**,§: See next page.

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Examples of Use of Design Ranges:

With ultor voltage of	*10000*	*14000*	*volts*
and grid-No.2 voltage of	*300*	*300*	*volts*
Grid-No.4 Voltage for focus with ultor current of 100 μa	-50 to +350	+70 to +470	volts
Grid-No.1 Voltage for visual extinction of focused raster	-26 to -70	-26 to -70	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	26 to 70	26 to 70	volts
Minimum Field Strength of PM Ion-Trap Magnet	36	43	gausses

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 Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	14000 max.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value	500 max.	volts
Negative value	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	510 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive-peak value	160 max.	volts
Positive-bias value	110 max.	volts
Negative-bias value	0 max.	volts
Negative-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

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_{5g_1}}$) between 8000▲ and 14000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_{2g_1}}$) between 225 and 510 volts

Grid-No.4-to-Grid-No.1 Voltage required for focus:

Changes directly with $E_{c_{5g_1}}$ at the rate of approximately 30 volts for each 1000-volt change in $E_{c_{5g_1}}$.

Changes inversely with $E_{c_{2g_1}}$ at the rate of approximately 10 volts for each 100-volt change in $E_{c_{2g_1}}$.

▲,#,**,§,■: See next page.

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Changes inversely with ultor current at the rate of approximately 25 volts for each 50-μa change in ultor current. For typical values, see *Examples of Use of Design Ranges.*

Cathode-to-Grid-No.1 Voltage ($E_{k_{g1}}$) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	Same value as determined for $E_{k_{g1}}$	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Ion-Trap Magnet Current (Average)**	$\sqrt{E_{c_{59}}/14000} \times 38$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{E_{c_{59}}/14000} \times 43$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*10000*	*14000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*300*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus with ultor current of 100 μa	−50 to +350	+70 to +470	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	26 to 59	26 to 59	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	26 to 59	26 to 59	volts
Minimum Field Strength of PM Ion-Trap Magnet	36	43	gausses

Maximum Circuit Values:

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

▲,#,**,§,■: See next page.

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PICTURE TUBE

▲ Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

\# Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 8,000 volts.

** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

§ For specimen PM ion-trap magnet, such as Heppner Model No.EM37 or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 5 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

■ 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.

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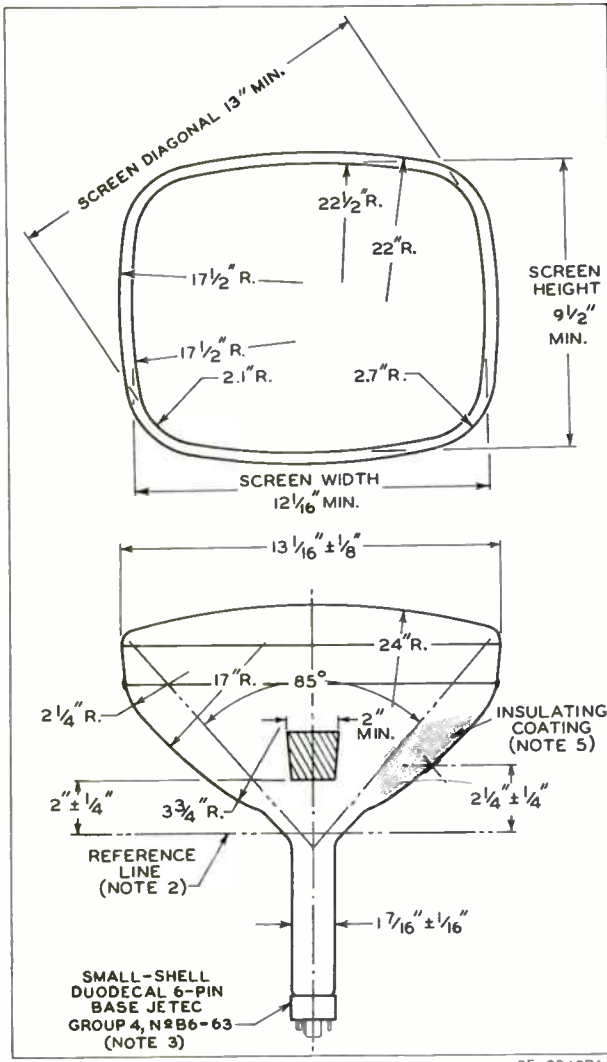
PICTURE TUBE



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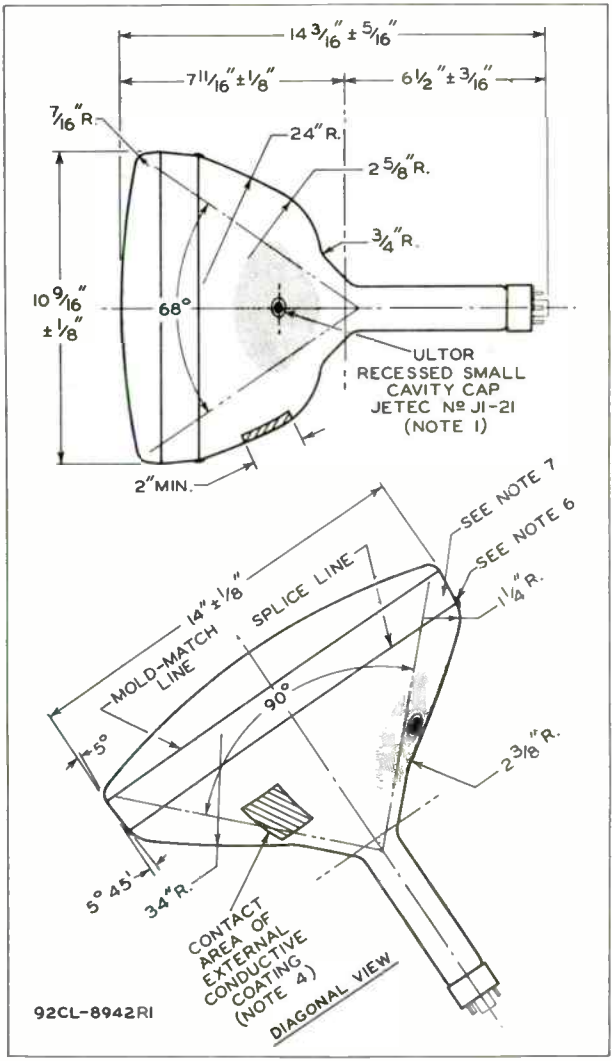
PICTURE TUBE



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PICTURE TUBE

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 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 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.

NOTE 6: BULGE AT SPLICE-LINE SEAL WILL NOT PROTRUDE BEYOND THE MAXIMUM INDICATED VALUE FOR ENVELOPE WIDTH, DIAGONAL OR HEIGHT.

NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

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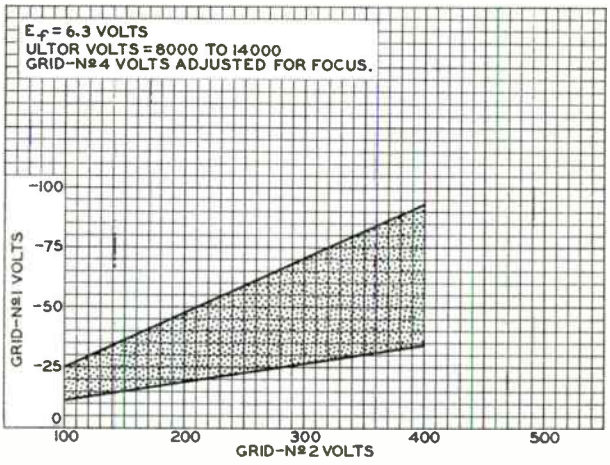
14RP4-A

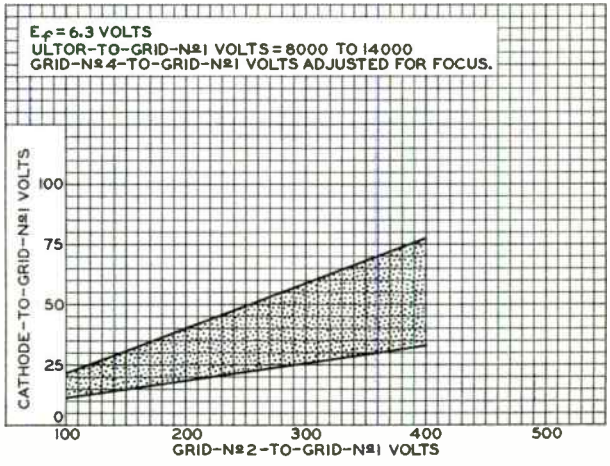
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



92CS-8972RI

CATHODE-DRIVE SERVICE



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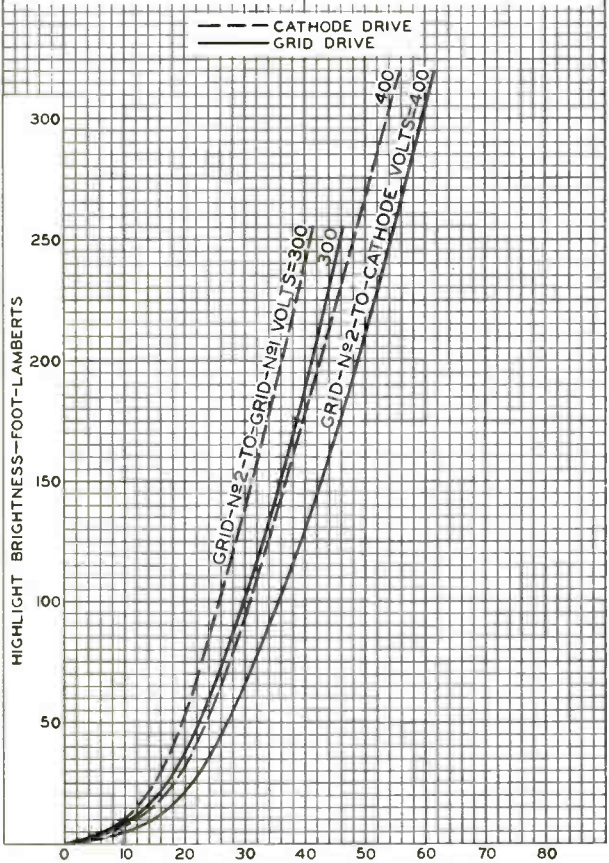
RCA

14RP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 10000	ULTOR VOLTS = 10000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 11"x 8 1/4"	RASTER SIZE = 11"x 8 1/4"



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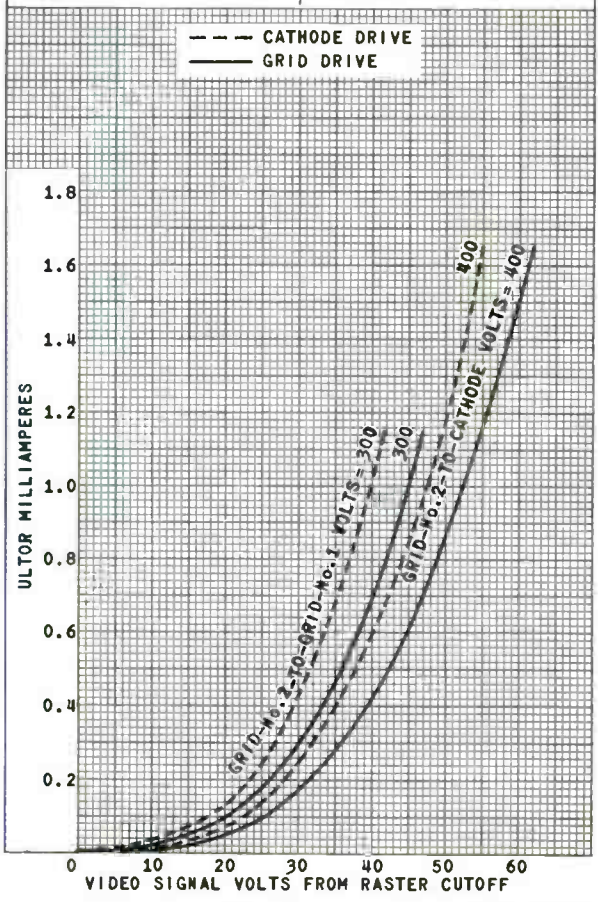
92CM-9014

RCA

14RP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-No.1 VOLTS = 8000 TO 14000	ULTOR VOLTS = 8000 TO 14000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF.	GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



14WP4/14ZP4
PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

Intended for use in equipment having series heater-string arrangement

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 5% amp
Warm-up time (Average)	11 sec
For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of Receiving Tube Section.	
Direct Interelectrode Capacitances:	
Grid No.1 to all other electrodes	6 μμf
Cathode to all other electrodes	5 μμf
External conductive coating to ultor	1200 max. μμf 800 min. μμf
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	78%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	90°
Horizontal	85°
Vertical	68°
Electron Gun	Type Requiring No Ion-Trap Magnet
Tube Dimensions:	
Overall length	13-3/16" ± 5/16"
Greatest width	13-1/16" ± 1/8"
Greatest height	10-9/16" ± 1/8"
Diagonal	14" ± 1/8"
Neck length	5-1/2" ± 3/16"
Screen Dimensions (Minimum):	
Greatest width	12-1/16"
Greatest height	9-1/2"
Diagonal	13"
Projected area	104 sq. in.
Weight (Approx.)	8.5 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Bulb	J112A1/B1
Base	Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-63)

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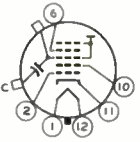
PICTURE TUBE

Basing 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



Cap – Ultor (Grid 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-Center Values:*

ULTOR VOLTAGE	14000 max.	volts
	9000* min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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 voltage (E_{c_5k}) between 9000 and 14000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus§	0 to +350 volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage

▲,*,§: See next page.

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PICTURE TUBE

Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*12000*	*volts*
and grid-No.2 voltage of	*300*	*volts*
Grid-No.4 Voltage for focus	0 to +350	volts
Grid-No.1 Voltage for visual extinction of focused raster	−28 to −72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	28 to 72	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:***

ULTOR-TO-GRID-No.1 VOLTAGE	14000	max.	volts
	9000●	min.	volts
GRID-No.4-TO-GRID-No.1 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	140	max.	volts
Negative-bias value	0	max.	volts
Negative-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.	volts
After equipment warm-up period	180	max.	volts
Heater positive with respect to cathode	180	max.	volts

▲,●,§,*,■: See next page.

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14WP4/14ZP4

PICTURE TUBE

Equipment Design Ranges:

With ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) between 9000 and 14000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 225 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§	0 to +350	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*12000*	*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 +350	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	25 to 58	volts
Cathode-to-Grid-No.1 Viceo Drive from Raster Cutoff (Black Level): White-level value	−25 to −58	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.

* Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 8,000 volts.

§, •, ■: See next page.

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PICTURE TUBE

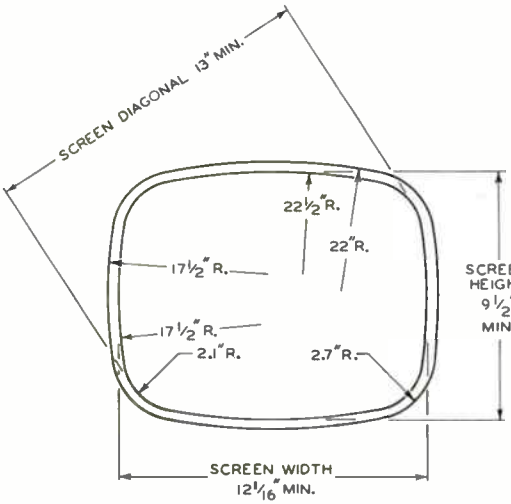
§ The grid-No.4 voltage or grid-No.4-to-grid-No.1 voltage required for focus of any individual tube is independent of ultor current and will remain essentially constant for values of ultor voltage (or ultor-to-grid-No.1 voltage) or grid-No.2 voltage (or grid-No.2-to-grid-No.1 voltage) within design ranges shown for these items.

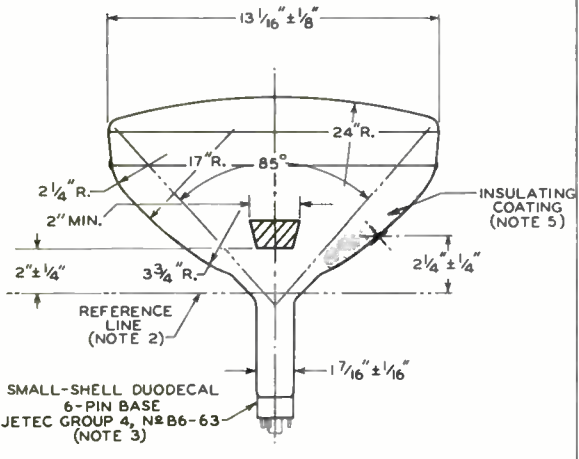
* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having 1/4-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/4-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

14WP4/14ZP4
PICTURE TUBE





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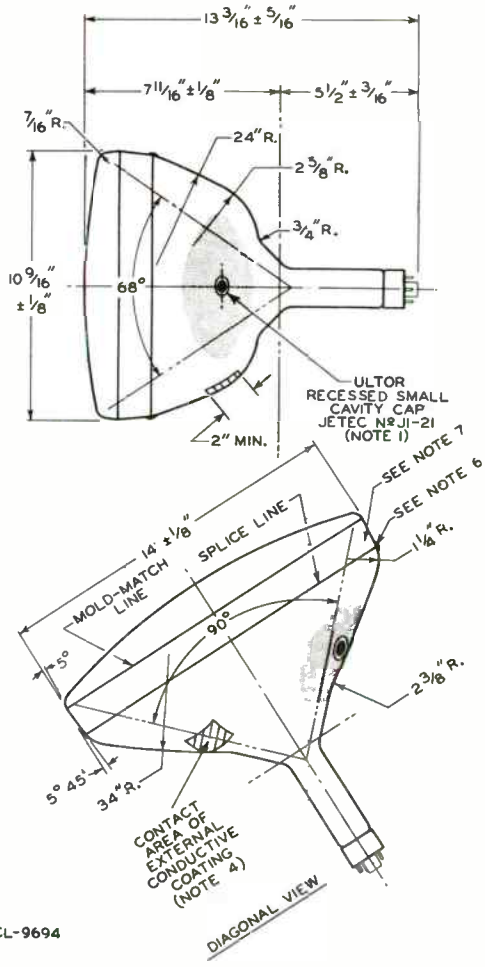
14WP4/14ZP4
PICTURE TUBE



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14WP4/14ZP4
PICTURE TUBE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND BULB TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. BULB 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 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.

NOTE 6: BULGE AT SPLICE-LINE SEAL WILL NOT PROTRUDE BEYOND THE MAXIMUM INDICATED VALUE FOR ENVELOPE WIDTH, DIAGONAL, OR HEIGHT.

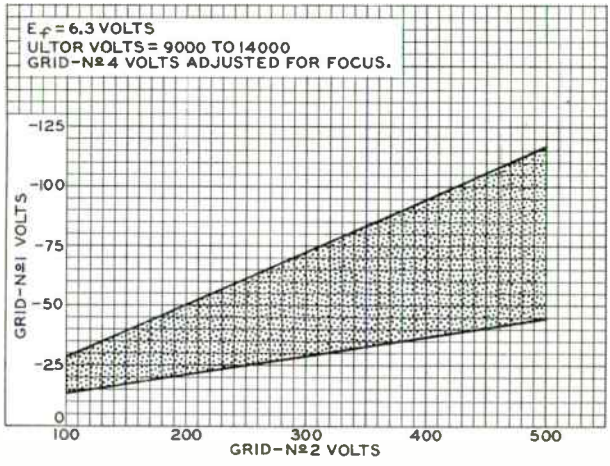
NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

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

14WP4/14ZP4

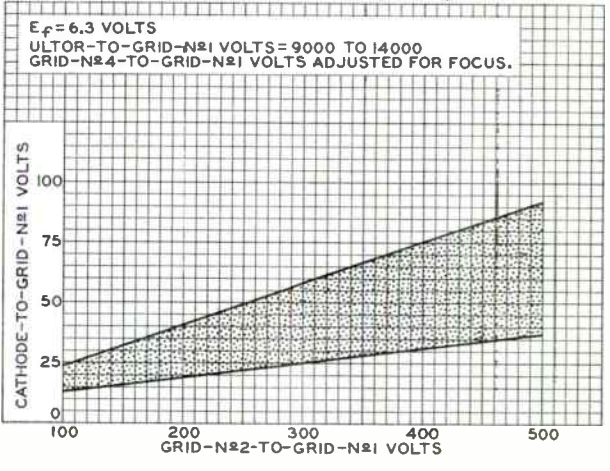
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



92CS-9699

CATHODE-DRIVE SERVICE



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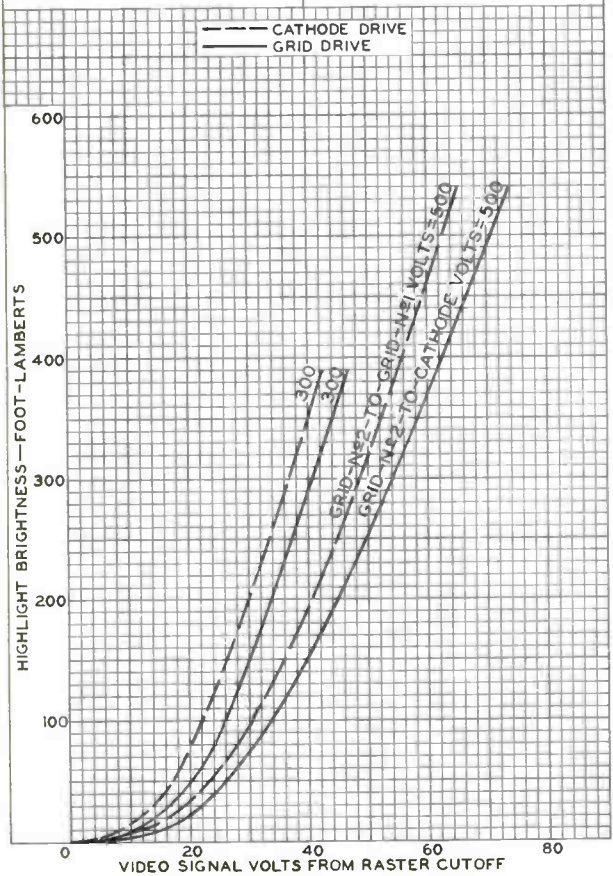
14WP4

RCA

14WP4/14ZP4

AVERAGE DRIVE CHARACTERISTICS

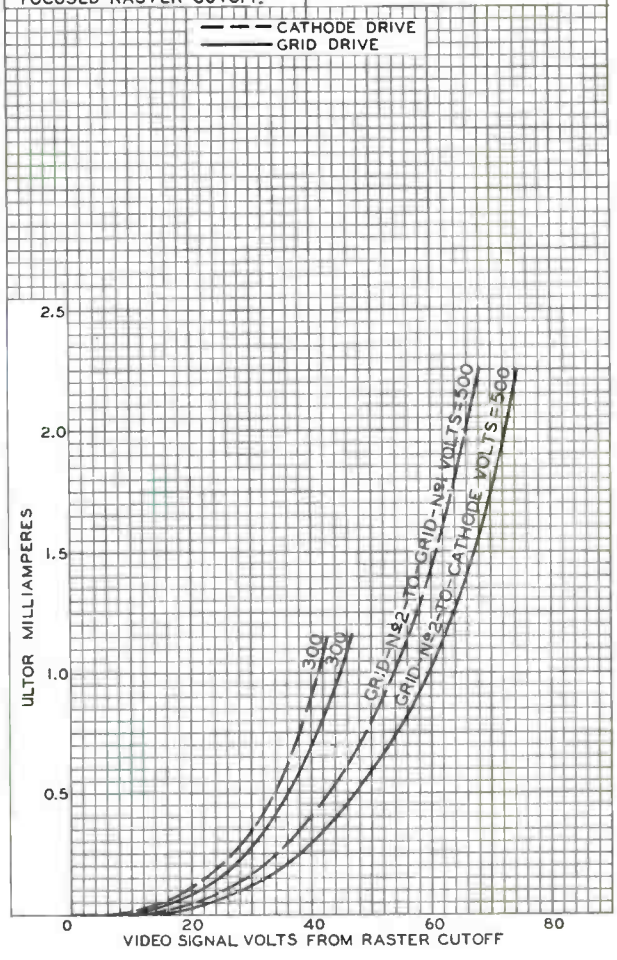
CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 14000	ULTOR VOLTS = 14000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 11" x 8 1/4"	RASTER SIZE = 11" x 8 1/4"



14WP4/14ZP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f=6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS = 9000 TO 14000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 6.3 VOLTS ULTOR VOLTS = 9000 TO 14000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



15GP22

TRICOLOR KINESCOPE

THREE-GUN SHADOW-MASK TYPE — ELECTROSTATIC FOCUS
ELECTROSTATIC CONVERGENCE — MAGNETIC DEFLECTION

DATA

General:

Electron Guns, Three	Blue, Green, Red	
Heater, for Unipotential Cathode of Each Gun, Paralleled with Each of the Other Two Heaters within Tube:		
Voltage (AC or DC)	6.3	volts
Current	1.8	amp
Direct Interelectrode Capacitances(Approx.):		
Grid No.1 of Any Gun to All Other Electrodes Except the No.1 Grids of the Other Two Guns	7.5	μμf
Cathode of Blue Gun + Cathode of Green Gun + Cathode of Red Gun to All Other Electrodes	17.5	μμf
Grid No.3 (Of Each Gun Tied within Tube to No.3 Grids of Other Two Guns) to All Other Electrodes	12	μμf
Grid No.4 (Common to the Three Guns) to All Other Electrodes	7	μμf
External Conductive Coating to Ultor[•]	3000 max. 1500 min.	μμf μμf
Faceplate, Spherical	Clear Glass	
Screen, Flat:		
Type	Metal-Backed, Tricolor, Phosphor-Dot	
Plate	Filterglass	
Light Transmission (Approx.)	70%	
Size (Rounded Sides—See Dimensional Outline)	11-1/2" x 8-5/8"	
Area	88.5 sq. in.	
Phosphor (Three Separate Phosphors, collectively)	P22	
Fluorescence and Phosphorescence of Separate Phosphors, respectively	Blue, Green, Red	
Persistence of Group Phosphorescence	Medium	
Dot Arrangement	Approx. 195,000 triangular groups, each consisting of blue dot, green dot, and red dot (total of 585,000 dots)	
Focusing Method	Electrostatic	
Convergence Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Horizontal	45°	
Vertical	35°	
Tube Dimensions:		
Maximum Overall Length	26-1/8"	
Greatest Diameter:		
At faceplate	14-5/8" ± 5/32"	
At metal flange	15-3/4" max.	
Weight	25 lbs	

15GP22

RCA

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TRICOLOR KINESCOPE

Mounting Position	Any
Ultor● Terminal	Metal Flange
Bulb	J126
Base	Small-Shell Bidecal 14-Pin (JETEC No.B14-103)

BOTTOM VIEW

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: No Connection
Pin 6: Grids No.3
Pin 7: Cathode of Green Gun
Pin 8: Grid No.1 of Green Gun
Pin 9: Grid No.2 of Green Gun
Pin 13: Grid No.4
Pin 17: Grid No.2 of Blue Gun
Pin 18: Grid No.1 of Blue Gun
Pin 19: Cathode of Blue Gun
Pin 20: Heater
Metal Flange: Ultor (Grid No.5, Grid No.6, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR● VOLTAGE	20000 max.	volts
ULTOR INPUT	15# max.	watts
GRID-No.4 VOLTAGE	11000 max.	volts
GRID-No.3 VOLTAGE	5000 max.	volts
GRID-No.2 VOLTAGE (Each Gun)	500 max.	volts
GRID-No.1 VOLTAGE (Each Gun):		
Negative bias value	200 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE (Each Gun):		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Equipment Design Ranges:

For ultor voltage (E_{c5}) of 18000 to 20000 volts

Grid-No.4 (Converging Electrode) Voltage†	42.5% to 51% of E_{c5}	volts
Grid-No.3 (Focusing Electrode) Voltage	12% to 19% of E_{c5}	volts

● 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 15GP22, the ultor function is performed by grid No.5. Since grid No.5, grid No.6, and collector are connected together within the tube, they are collectively referred to simply as "ultor", for convenience in presenting data and curves.

This value is the product of ultor voltage and average current measured at the ultor terminal with a dc ammeter.

† See next page.

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TRICOLOR KINESCOPE

Grid-No.2 Voltage (Each Gun) when circuit design utilizes grid-No.1 Voltage (E_{c1}) at fixed value for raster cutoff (each gun) . . .	2 to 4.5 times E_{c1}	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster (Each Gun) when circuit design utilizes grid-No.2 voltage (E_{c2}) at fixed value (each gun)	22.5% to 50% of E_{c2}	volts
Grid-No.4 Current	-5 to +5	μamp
Maximum Grid-No.3 Current . . .	300	μamp
Grid-No.2 Current	-15 to +15	μamp
Beam-Current Ratio to Produce Illuminant-C White:		
Red Gun to Green Gun	4:1 to 1:1	
Blue Gun to Green Gun	1.5:1 to 0.5:1	
Maximum Raster Shift in Any Direction from Screen Center□ . . .	1-1/4	inches

Examples of Use of Design Ranges:

For ultor voltage of 20000 volts

Grid-No.4 (Converging Electrode) Voltage† . .	8500 to 10200	volts
Grid-No.3 (Focusing Electrode) Voltage . . .	2400 to 3800	volts
Grid-No.2 Voltage (Each Gun) when circuit design utilizes grid-No.1 voltage of -70 volts for raster cutoff (each gun) .	140 to 315	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster (Each Gun) when circuit design utilizes grid-No.2 voltage of 200 volts (each gun)	-45 to -100	volts

Circuit Values:

Grid-No.1-Circuit Resistance (Each Gun). .	1.5 max.	megohms
Dynamic Converging Voltage (Approx.)** . .	900	volts
Dynamic Focusing Voltage (Approx.)** . . .	225	volts

† This range does not include the dc component of the dynamic converging voltage.

□ 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 the raster shift resulting from optimum adjustments for convergence, color purity, and concentricity.

** Peak-to-peak value. This ac voltage having essentially parabolic waveform is synchronized with scanning and does not include any voltage developed during the blanking time.

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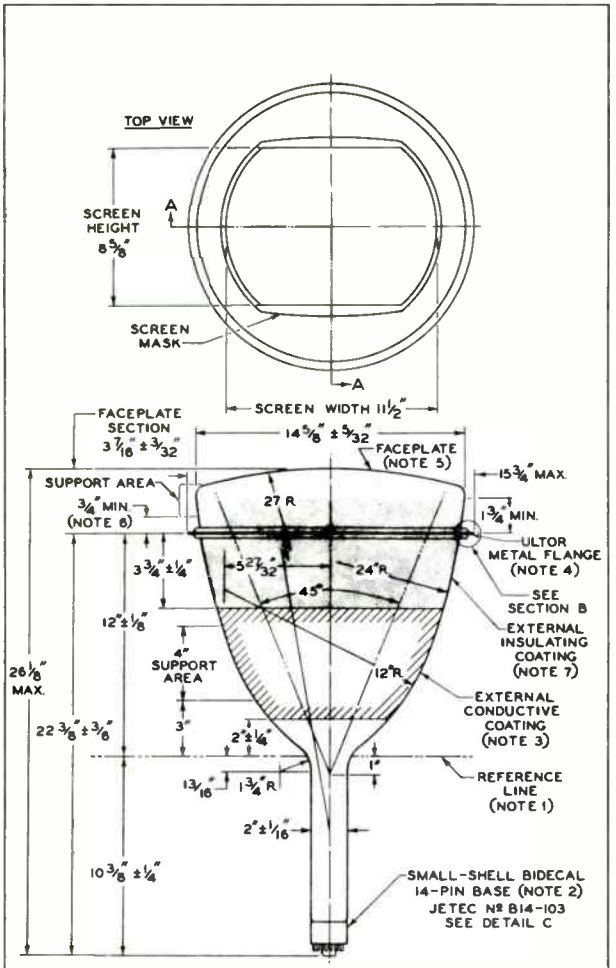
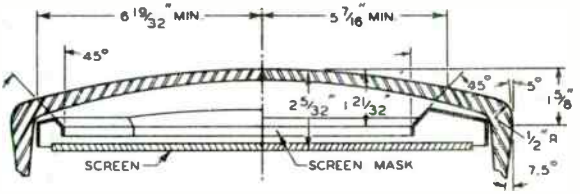
TRICOLOR KINESCOPE

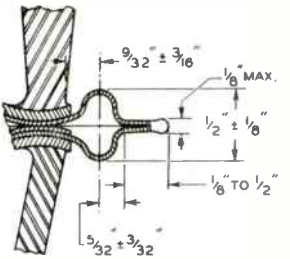


15GP22

TRICOLOR KINESCOPE



ENLARGED SECTION A-A



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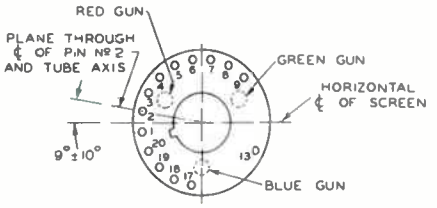

BASE DETAIL C
BOTTOM VIEW

92CL-8072R1

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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TRICOLOR KINESCOPE

NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE A CYLINDRICAL GAUGE 2.400" ± 0.001" I.D. WHICH IS HELD CONCENTRIC WITH TUBE NECK AXIS WILL REST ON 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 FACEPLATE-SECTION AXIS AND HAVING A DIAMETER OF 3".

NOTE 3: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 4: METAL FLANGE OPERATES AT HIGH VOLTAGE. ADEQUATE INSULATION MUST BE PROVIDED BETWEEN THE FLANGE AND ANY GROUNDED ELEMENT IN THE RECEIVER TO PREVENT THE POSSIBILITY OF ELECTRICAL LEAKAGE INCLUDING CORONA.

NOTE 5: MASK MATERIAL BEARING ON THE FACEPLATE MUST HAVE INSULATING QUALITIES ADEQUATE FOR ONE HALF THE APPLIED ULTOR VOLTAGE TO MINIMIZE SURFACE LEAKAGE BETWEEN METAL FLANGE AND MASK.

NOTE 6: TUBE SHOULD NOT BE SUPPORTED IN THIS AREA.

NOTE 7: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

16ANP4

Picture Tube

RECTANGULAR GLASS TYPE WITH INTEGRAL PROTECTIVE WINDOW
LOW-VOLTAGE ELECTROSTATIC FOCUS — 114° MAGNETIC DEFLECTION
NO ION-TRAP MAGNET REQUIRED — 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	1200 max. / 800 min.	pf
Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For Curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate and Protective Window	Filterglass
Light transmission (Approx.)	60%

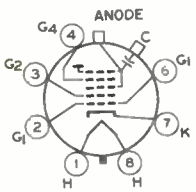
Mechanical:

Weight (Approx.)	9.5 lbs
Overall Length	10.438" ± 0.312"
Neck Length	4.125" ± 0.125"
Projected Area of Screen	125 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 J125 A* sheets 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

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 and Minimum Ratings, *Design-Maximum Values:*

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

Anode Voltage	18000 max.	volts
	10000 min.	volts
Grid-No.4 (Focusing) Voltage:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
Grid-No.2 Voltage	550 max.	volts
	200 min.	volts
Grid-No.1 Voltage:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
Heater Voltage	6.9 max.	volts
	5.7 min.	volts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions for Cathode-Drive Service:

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

Anode Voltage	14000	volts
Grid-No.4 Voltage	0 to 400	volts
Grid-No.2 Voltage	300	volts
Cathode Voltage for visual extinction of focused raster	31 to 57	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

RCA

16AP4-A

PICTURE TUBE

ROUND METAL-SHELL TYPE

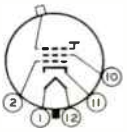
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp ←
Faceplate, Spherical	Filterglass
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type
Deflection Angle (Approx.)	53°
Electron Gun	Ion-Trap Type Requiring External Single-Field Magnet ←
Maximum Overall Length	22-5/16"
Greatest Diameter of Bulb	15-7/8" ± 1/8"
Minimum Useful Screen Diameter	14-3/8" ←
Operating Position	Any
Ultor Terminal	Metal-Shell Lip
Base . . Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57)	←
Basing Designation for BOTTOM VIEW	12D ←

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 Ratings, ***Design-Center Values:***

ULTOR VOLTAGE	14000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 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 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Maximum Circuit Values:

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

← Indicates a change.

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

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **114° MAGNETIC DEFLECTION**

GENERAL DATA

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 . .	1300 max.	pf
	800 min.	pf
Heater Current at 6.3 volts.	450 ± 20	ma
Heater Warm-Up Time (Average).	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

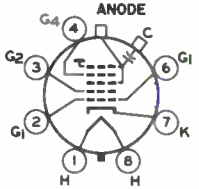
Optical:

Phosphor (For Curves, see front of this Section). . P4—Sulfide Type, Aluminized
Faceplate. . . . . Filterglass
Light transmission (Approx.) 78%

Mechanical:

Weight (Approx.) . . . . . 8-1/2 lbs
Overall Length . . . . . 10-1/4" ± 1/4"
Neck Length. . . . . 4-1/8" ± 1/8"
Projected Area of Screen . . . . . 125 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 J125 C2* sheets 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

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 and Minimum Ratings, *Design-Maximum Values:*

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

ANODE VOLTAGE.	20000 max.	volts
	12000 min.	volts

16AYP4

GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max. 200 min.	volts volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts 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 and 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

Anode Voltage	16000	volts
Grid-No.4 Voltage[a]	100	volts
Grid-No.2 Voltage	300	volts
Cathode Voltage for visual extinction of focused raster	28 to 60	volts
Field Strength of required adjustable Centering Magnet	0 to 8	gausses

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

[a] The grid-No.4 voltage required for optimum focus of any individual tube will have a value anywhere between -100 and +300 volts.

16BGP4

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 — **114° MAGNETIC DEFLECTION**

NO ION-TRAP MAGNET REQUIRED

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[a]	1300 max. / 800 min.	pf / pf
Heater Current at 6.3 volts	450 ±20	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Faceplate	Filterglass
Light transmission at center (Approx.)	54%

Mechanical:

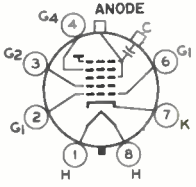
Weight (Approx.)	9.5 lbs
Overall Length	10.569" ± .242"
Neck Length	4.375" ± .125"
Projected Area of Screen	125 sq. in.
External Conductive Coating:	
Type	Regular Band
Contact area for grounding	Near Reference Line

For Additional Information on Coatings, Dimensions, and Deflection Angles, See *Picture-Tube Dimensional-Outlines* and *Bulb J125 B* sheets 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



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 and Minimum Ratings, *Design-Maximum Values:*

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

Anode Voltage	20000 max.	volts
	12000 min.	volts
Grid-No.4 Voltage:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
Grid-No.2 Voltage	550 max.	volts
	200 min.	volts
Grid-No.1 Voltage:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
Heater Voltage	6.9 max.	volts
	5.7 min.	volts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	300 max.	volts
Heater positive with respect to cathode:		
Peak value	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

Anode Voltage	16000	volts
Grid-No.4 Voltage[b]	100	volts
Grid-No.2 Voltage	300	volts
Cathode Voltage for visual extinction of focused raster	28 to 60	volts
Field Strength of required adjustable centering magnet	0 to 8	gauss

Maximum Circuit Values:

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

[a] Includes implosion protection hardware.

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

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

16DP4-A
PICTURE TUBE

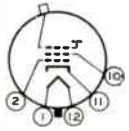
ROUND GLASS TYPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp ←
Faceplate, Spherical	Filterglass
Phosphor (For curves, see front of this Section)	P4—Sulfide Type
Deflection Angle (Approx.)	60°
Electron Gun	Ion-Trap Type Requiring External Single-Field Magnet ←
Overall Length	20-3/4" ± 1/4"
Greatest Diameter of Bulb	15-7/8" ± 1/8"
Minimum Useful Screen Diameter	14-1/2"
Operating Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Base	Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57) ←
Basing Designation for BOTTOM VIEW	12D ←



Pin 1 – Heater
Pin 2 – Grid No.1
Pin 10 – Grid No.2
Pin 11 – Cathode
Pin 12 – Heater
Cap▲ – Ultor (Grid No.3, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	15000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 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 seconds	410 max.	volts
After equipment warm-up period	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

Maximum Circuit Values:

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

▲ Cap may be aligned with either vacant pin position 6 or vacant pin position 3.

← Indicates a change.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

16GP4-B
PICTURE TUBE

ROUND METAL-SHELL TYPE

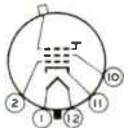
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp
Faceplate, Spherical	Frosted Filterglass
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type
Deflection Angle (Approx.)	70°
Electron Gun	Ion-Trap Type Requiring External Single-Field Magnet
Maximum Overall Length	17-11/16"
Greatest Diameter of Bulb	15-7/8" ± 1/8"
Minimum Useful Screen Diameter	14-3/8"
Operating Position	Any
Ultor Terminal	Metal-Shell Lip
Base	Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57) ←
Basing Designation for BOTTOM VIEW	12D

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 Ratings, *Design-Center Values:*

ULTOR VOLTAGE	14000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 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 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Maximum Circuit Values:

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

← Indicates a change.

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

16LP4-A
PICTURE TUBE

ROUND GLASS TYPE

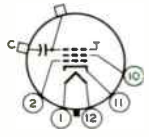
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Uripotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp ←
Capacitance between External Conductive Coating and Ultor	2000 max. μμf 750 min. μμf
Faceplate, Spherical	Filterglass
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type
Deflection Angle (Approx.)	52°
Electron Gun	Ion-Trap Type Requiring ← External Single-Field Magnet
Overall Length	22-1/4" ± 3/8"
Greatest Diameter of Bulb	15-7/8" ± 1/8"
Minimum Useful Screen Diameter	14-1/2"
Operating Position	Any
Cap	Recessed Small Cavity (JETEC No. J1-21)
Base	Small-Shell Duodecal 5-Pin (JETEC Group 4, No. B5-57) ←
Basing Designation for BOTTOM VIEW	12N ←

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



Cap▲ – Ultor (Grid No.3, Collector)
C – External Conductive Coating

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	14000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 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 seconds	410 max.	volts
After equipment warm-up period	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

Maximum Circuit Values:

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

▲ Cap may be aligned with either vacant pin position 6 or vacant pin position 3.

← Indicates a change.

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

16RP4A

Picture Tube

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
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
External conductive coating to anode	1500 max. 750 min.	pf
Heater Current at 6.3 volts	600 ± 30	ma
Electron Gun	Ion-Trap Type Requiring External Single-Field Magnet	

Optical:

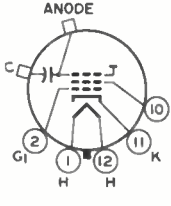
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	66%

Mechanical:

Weight (Approx.)	16 lbs
Overall Length	18-3/4" ± 3/8"
Neck Length	7-1/2" ± 3/16"
Projected Area of Screen	139 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 J129 A/B* sheets at front of this section

Cap	Recessed Small Cavity (JEDEC No.J1-21)
Base	Small-Shell Duodecal 5-Pin (JEDEC Group 4, No.B5-57)
Basing Designation for BOTTOM VIEW	12N



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	17500 max.	volts
GRID-No.2 VOLTAGE	450 max.	volts

16RP4A

GRID-No.1 VOLTAGE:		
Negative bias value	140 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts 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	165 max.	volts
Heater positive with respect to cathode:		
Combined AC and DC voltage	165 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	12000	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

16RP4/16KP4, 16RP4-A/16KP4-A

PICTURE TUBES

RECTANGULAR GLASS TYPES

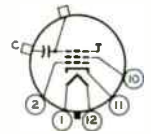
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Capacitance between External Conductive Coating and Ultor	1500 max. 750 min.	μμf μμf
Faceplate, Spherical		Filterglass
Phosphor (For Curves, see front of this Section)	*Type 16RP4* P4—Sulfide Type	*Type 16RP4-A* P4—Sulfide Type Aluminized
Deflection Angles (Approx.):		
Diagonal		70°
Horizontal		65°
Vertical		50°
Electron Gun		Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:		
Overall length		18-3/4" ± 3/8"
Greatest width		14-3/4" ± 1/8"
Greatest height		11-1/2" ± 1/8"
Diagonal		16-1/8" ± 1/8"
Neck length		7-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)		27"
Screen Dimensions (Minimum):		
Greatest width		13-1/2"
Greatest height		10-1/8"
Diagonal		14-7/8"
Projected area		131 sq. in.
Operating Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Base . . Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57)		←
Basing Designation for BOTTOM VIEW		12N

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



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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts

← Indicates a change.

16RP4/16KP4,
16RP4-A/16KP4-A
PICTURE TUBES

GRID-No.1 VOLTAGE:		
Negative-bias value.	125 max.	volts
Positive-bias value.	0 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 seconds	410 max.	volts
After equipment warm-up period . . .	150 max.	volts
Heater positive with respect to cathode.	150 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

16TP4

PICTURE TUBE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 ± 10% . . . . . amp ←

Capacitance between External Conductive Coating and Ultor . . . . . 2000 max. μμf; 750 min. μμf

Faceplate, Spherical . . . . . Filterglass

Phosphor (For Curves, see front of this Section) . P4—Sulfide Type

Deflection Angles (Approx.):
- Diagonal . . . . . 70°
- Horizontal . . . . . 65°
- Vertical . . . . . 50°

Electron Gun . . . . . Ion-Trap Type Requiring External Single-Field Magnet

Tube Dimensions:
- Overall length . . . . . 18-1/8" ± 3/8"
- Greatest width . . . . . 14-3/4" ± 1/8" ←
- Greatest height . . . . . 11-1/2" ± 1/8" ←
- Diagonal . . . . . 16-1/8" ± 1/8" ←
- Neck length . . . . . 6-7/8" ± 3/16"
- Radius of curvature of faceplate (External surface) . . 27"

Screen Dimensions (Minimum):
- Greatest width . . . . . 13-1/2"
- Greatest height . . . . . 10-1/8"
- Diagonal . . . . . 14-7/8"

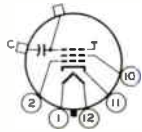
Operating Position . . . . . Any

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

Base . . Small-Sheil Duodecal 5-Pin (JETEC Group 4, No. B5-57) ←

Basing Designation for BOTTOM VIEW . . . . . 12N ←

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



Cap – Ultor (Grid No. 3, Collector)
C – External Conductive Coating

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	14000 max.	volts
GRID-No. 2 VOLTAGE	410 max.	volts
GRID-No. 1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

←Indicates a change.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

16TP4

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 . . .	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance	1.5 max.	megohms

16WP4-A
PICTURE TUBE

ROUND GLASS TYPE

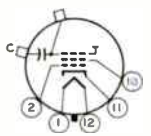
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Uripotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp ←
Capacitance between External Conductive Coating and Ultor	1500 max. 750 min.	μμf μμf
Faceplate, Spherical		Filterglass
Phosphor (For Curves, see front of this Section)		P4—Sulfide Type
Deflection Angle (Approx.)		70°
Electron Gun		Ion-Trap Type Requiring External Single-Field Magnet ←
Overall Length		17-3/4" ± 3/8"
Greatest Diameter of Bulb		15-7/8" ± 1/8"
Minimum Useful Screen Diameter		14-1/2"
Operating Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Base . . .		Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57) ←
Basing Designation for BOTTOM VIEW		12N ←

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



Cap▲ – Ultor (Grid No.3, Collector)
C – External Conductive Coating

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 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 seconds	410 max.	volts
After equipment warm-up period	125 max.	volts
Heater positive with respect to cathode	125 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

▲ Cap may be aligned with either vacant pin position 6 or vacant pin position 3.

← Indicates a change.

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

17AVP4/17ATP4
PICTURE TUBE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

The 17AVP4/17ATP4 is the same as the 17AVP4-A/17ATP4-A except that it utilizes a *non-aluminized phosphor*.

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

17AVP4-A/17ATP4-A
PICTURE TUBE

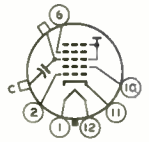
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc 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	1500 max. 1000 min.	μμf ←
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		74%
Phosphor (For Curves, see front of this Section)		P4—Sulfide Type Aluminized
Fluorescence		White
Phosphorescence		White
Persistence		Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		90°
Horizontal		85°
Vertical		68°
Electron Gun		Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:		
Overall length		15-5/8" ± 3/8"
Greatest width		15-25/64" ± 1/8"
Greatest height		12-9/32" ± 1/8"
Diagonal		16-5/8" ± 1/8"
Neck length		6-1/2" ± 3/16"
Screen Dimensions (Minimum):		
Greatest width		14-5/16"
Greatest height		11-1/8"
Diagonal		15-9/16"
Projected area		149 sq. in.
Weight (Approx.)		15 lbs
Operating Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Bulb		J133 F1/G1 ←
Base		Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-63) ←
Basing 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



Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

← Indicates a change.

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

17AVP4-A/17ATP4-A

PICTURE TUBE

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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 voltage (E_{c_5k}) between 12000# and 16000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus with ultor current of 100 μa	−0.4% to +2.2% of E_{c_5k}	volts
Grid-No.1 Voltage for visual extinction of focused raster	−9.3% to −24% of E_{c_2k}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	9.3% to 24% of E_{c_2k}	volts
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_5k}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_5k}}{16000}} \times 33$	gauss
Field Strength of Adjustable Centering Magnet	0 to 8	gauss

▲,#,**,§: See next page.

17AVP4-A/17ATP4-A

PICTURE TUBE

Examples of Use of Design Ranges:

With ultor voltage of	*14000*	*16000*	*volts*
and grid-No.2 voltage of	*300*	*300*	*volts*
Grid-No.4 Voltage for focus with ultor current of 100 μa	−55 to +310	−65 to +350	volts
Grid-No.1 Voltage for visual extinction of focused raster	−28 to −72	−28 to −72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	28 to 72	28 to 72	volts
Minimum Field Strength of PM Ion-Trap Magnet	31	33	gausses

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 Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	16000 max.	volts
GRID-No.4-TO-GRID-No.1 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	140 max.	volts
Negative-bias value	0 max.	volts
Negative-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.	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.1 voltage ($E_{c_{g_1}}$) between 12000# and 16000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_{2g_1}}$) between 220 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus with ultor current of 100 μa	0% to 2.6% of $E_{c_{59}}$	volts

▲,#,**,§,■: See next page.

17AVP4-A/17ATP4-A
PICTURE TUBE

Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	8.5% to 19.4% of E_{c291}	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	8.5% to 19.4% of E_{c291}	volts
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c591}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c591}}{16000}} \times 33$	gauss
Field Strength of Adjustable Centering Magnet	0 to 8	gauss

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*14000*	*16000*	*volts*
and grid-No.2-to-grid No.1 voltage of	*300*	*300*	*volts*
Grid-No.4-to Grid-No.1 Voltage for focus with ultor current of 100 μa	0 to 365	0 to 415	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	25 to 58	25 to 58	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	25 to 58	25 to 58	volts
Minimum Field Strength of PM Ion-Trap Magnet	31	33	gauss

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.

\# Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 12,000 volts.

** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

§: ■: See next page.

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PICTURE TUBE

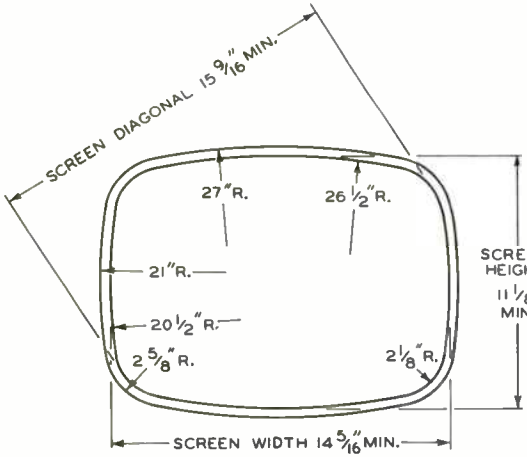
§ For specimen PM ion-trap magnet, such as Heppner Model No.EM37, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

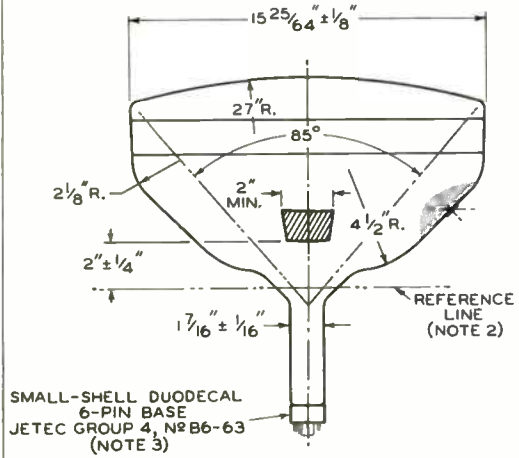
□ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

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

17AVP4-A/17ATP4-A

PICTURE TUBE





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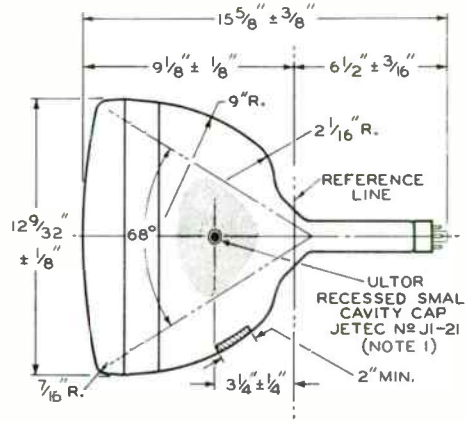
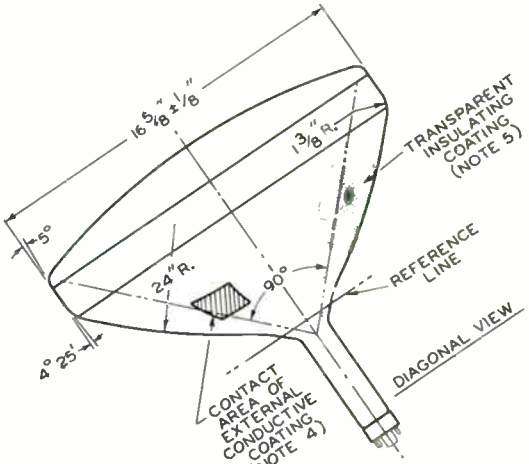
17AVP4-A/17ATP4-A
PICTURE TUBE





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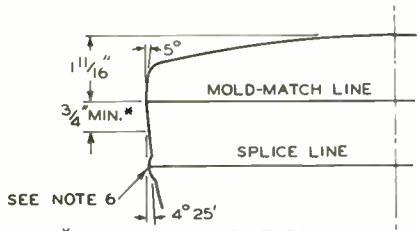
17AVP4-A/17ATP4-A
PICTURE TUBE



*MAXIMUM WIDTH OF TUBE SUPPORT BAND.

DETAIL OF PANEL

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 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 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 LINT-LESS CLOTH.

NOTE 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.

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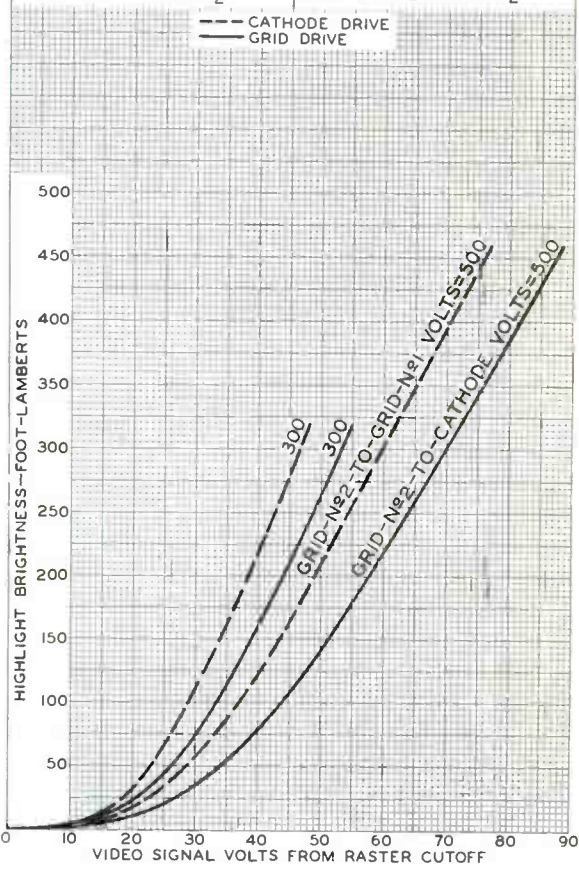
17AVP4-A/17ATP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f=6.3 VOLTS	E_f=6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS=16000	ULTOR VOLTS=16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE=14" x 10½"	RASTER SIZE=14" x 10½"



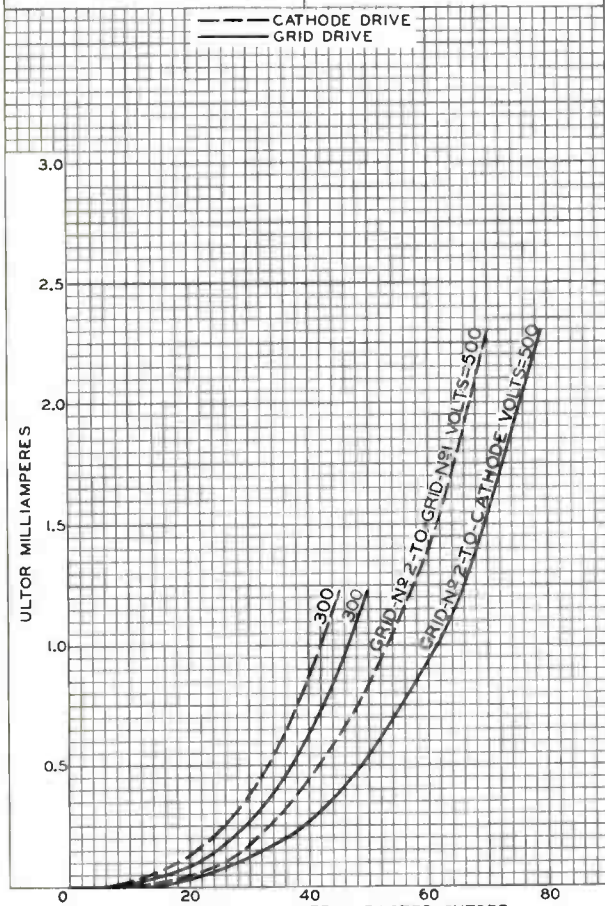
17AVP4-A

RCA

17AVP4-A/17ATP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS = 12000 TO 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 6.3 VOLTS ULTOR VOLTS = 12000 TO 16000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



17BVP4

PICTURE TUBE

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)	6.3	volts
Current	0.6 ± 5%	amp
Warm-up time (Average)	11	sec
Capacitance Between External Conductive Coating and Ultor	1500 max. 1000 min	μμf μμf
Faceplate, Spherical	Filterglass	
Phosphor (for Curves, see front of this Section)	P4—Sulfide Type Aluminized	
Deflection Angles (Approx.):		
Diagonal	110°	
Horizontal	105°	
Vertical	87°	
Electron Gun	Ion-Trap Type Requiring External Single-Field Magnet	
Tube Dimensions:		
Overall length	13-1/4" ± 5/16"	
Greatest width	15-5/8" ± 1/8"	
Greatest height	12-3/4" ± 1/8"	
Diagonal	16-9/16" ± 1/8"	
Neck length	6-1/8" ± 3/16"	
Radius of curvature of faceplate (External surface)	20-3/4"	
Screen Dimensions (Minimum):		
Greatest width	14-3/4"	
Greatest height	11-11/16"	
Diagonal	15-3/4"	
Projected area	155 sq. in.	
Operating Position	Any	
Cap	Recessed Small Cavity (JEDEC No. J1-21)	
Base	Special (JEDEC No. B6-185)	
Basing Designation for BOTTOM VIEW	7FA	

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, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max	volts
GRID-No.2 VOLTAGE	500 max.	volts

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

17BVP4

PICTURE TUBE

GRID-No.1 VOLTAGE:		
Negative-peak value.	200 max.	volts
Negative-bias value.	140 max.	volts
Positive-bias value.	0 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 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

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **90° MAGNETIC DEFLECTION**

GENERAL DATA

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 . .	1500 max. 1000 min.	pf pf
Heater Current at 6.3 volts.	600 ± 30	ma
Electron Gun	.Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For curves, see front of this Section) .	P4—Sulfide Type, Aluminized
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	74%

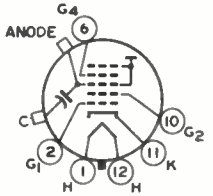
Mechanical:

Weight (Approx.)	15 lbs
Overall Length	14-5/8" ± 3/8"
Neck Length.	5-1/2" ± 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 and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J133 F/G* 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)
Basing 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



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 max. 11000 min.	volts 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 peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts 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	14000	volts
Grid-No.4 Voltage	-55 to +300	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.

Picture Tube

NO ION-TRAP MAGNET REQUIRED

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
MAGNETIC FOCUS — **70° MAGNETIC DEFLECTION**

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	1500 max. / 750 min.	pf
Heater Current at 6.3 volts	600 ± 60	ma
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For Curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate, Spherical	Filter-glass
Light transmission (Approx.)	74%

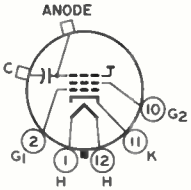
Mechanical:

Weight (Approx.)	18 lbs
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 and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J133B/D* sheets at front of this section

Cap	Recessed Small Cavity (JEDEC No.J1-21)
Base	Small-Shell Duodecal 5-Pin (JEDEC Group 4, No.B5-57)
Basing Designation for BOTTOM VIEW	12N

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

17BP4D

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

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

Anode Voltage	17500 max.	volts
Grid-No.2 Voltage	550 max.	volts
Grid-No.1 Voltage:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
Heater Voltage	6.9 max. 5.7 min.	volts 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	165 max.	volts
Heater positive with respect to cathode:		
Combined AC and DC voltage	165 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	12000	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

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° 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	6	pf
External conductive coating to anode	1500 max. 800 min.	pf pf ←
Heater Current at 8.4 volts	450 ± 45	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For Curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	78%

Mechanical:

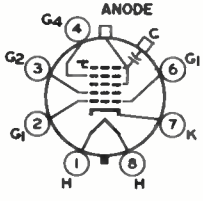
Weight (Approx.)	10 lbs
Overall Length	12-9/16" + 1/4" − 9/16"
Neck Length	5-7/16" + 1/8" − 7/16"
Projected Area of Screen	155 sq. in.
External Conductive Coating:	
Type	Regular-Band
Contact area for grounding	Near Reference Line

For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb Jigs 1/2 A/B* sheets at 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 (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



Cap – Anode (Grid No.3, Grid No.5, Screen, Collector)
C – External Conductive Coating

← Indicates a change.

→ **Maximum and Minimum Ratings,** *Design-Maximum Values:*

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

ANODE VOLTAGE	17600 max. 11000 min.	volts 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 peak value	220 max.	volts
Negative bias value	154 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
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	16000	volts
Grid-No.4 Voltage	0 to 400	volts
Grid-No.2 Voltage	400	volts
Grid-No.1 Voltage for visual extinction of focused raster	-36 to -94	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.

17CFP4

PICTURE TUBE

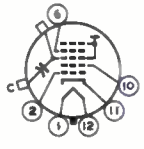
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

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	1500 max.	μμf
	1200 min.	μμf
Faceplate, Spherical	Filterglass	
Light transmission (Approx.)	79%	
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized	
Fluorescence	White	
Phosphorescence	White	
Persistence	Medium-Short	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	90°	
Horizontal	85°	
Vertical	68°	
Electron Gun	Type Requiring No Ion-Trap Magnet	
Tube Dimensions:		
Overall length	15" ± 3/8"	
Greatest width	15-5/8" ± 1/8"	
Greatest height	12-3/4" ± 1/8"	
Diagonal	16-9/16" ± 1/8"	
Neck length	5-1/2" ± 3/16"	
Radius of curvature of faceplate (External surface)	20-3/4"	
Screen Dimensions (Minimum):		
Greatest width	14-3/4"	
Greatest height	11-11/16"	
Diagonal	15-3/4"	
Projected area	155 sq. in.	
Weight (Approx.)	10 lbs	
Operating Position	Any	
Cap	Recessed Small Cavity (JEDEC No. J1-21)	
Bulb	J132-1/2 C1/D1	
Base	Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)	
Basing 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



Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

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

17CFP4

PICTURE TUBE

GRID-DRIVE▲ SERVICE

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

Maximum and Minimum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max. / 12000* min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-NO.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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 voltage (Ec_{3k}) between 12000 and 16000 volts and grid-No.2 voltage (Ec_{2k}) between 200 and 500 volts*

Grid-No.4 Voltage for focus§	-50 to +350	volts
Grid-No.1 Voltage for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive From Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for Ec_{1k} except video drive is a positive voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

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	-50 to +350	volts
Grid-No.1 Voltage for visual extinction of focused raster	-28 to -72	volts

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PICTURE TUBE

Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	28 to 72		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:*

ULTOR-TO-GRID-No.1 VOLTAGE	16000 12000●	max. min.	volts volts
GRID-No.4-TO-GRID-No.1 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	140	max.	volts
Negative-bias value	0	max.	volts
Negative-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.	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.1 voltage ($E_{c_3g_1}$) between 12000● and 16000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 220 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No.4 Current	-25 to +25	μa

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PICTURE TUBE

Grid-No.2 Current.	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gauss

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	28 to 60	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value.	−28 to −60	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 minimum* ultor- or ultor-to-grid-No.1 voltage is 10,800 volts, below which the serviceability of the 17CFP4 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 10,800 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-to-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 2-1/2". 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.

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

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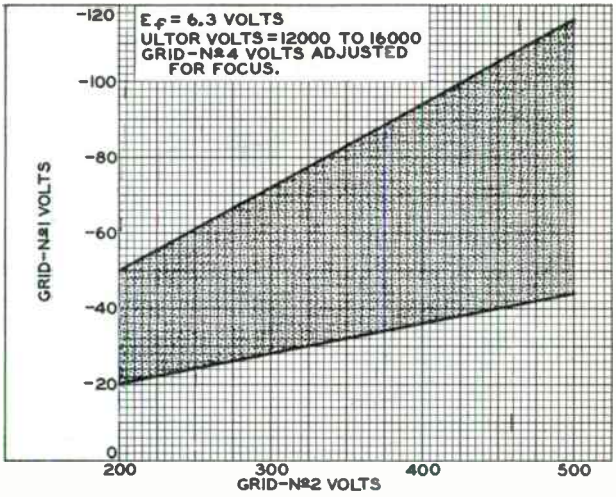
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



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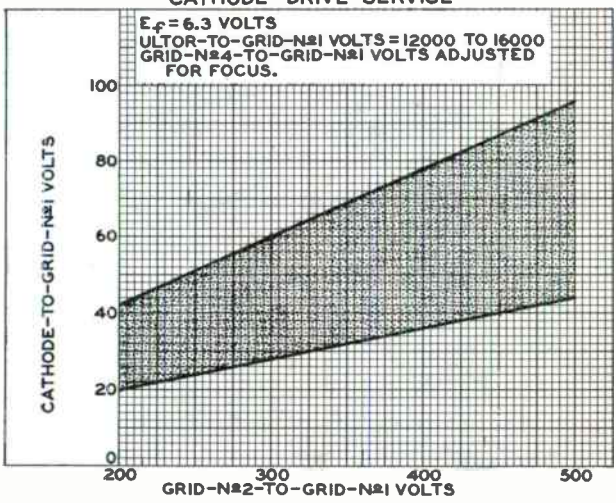
CATHODE-DRIVE SERVICE



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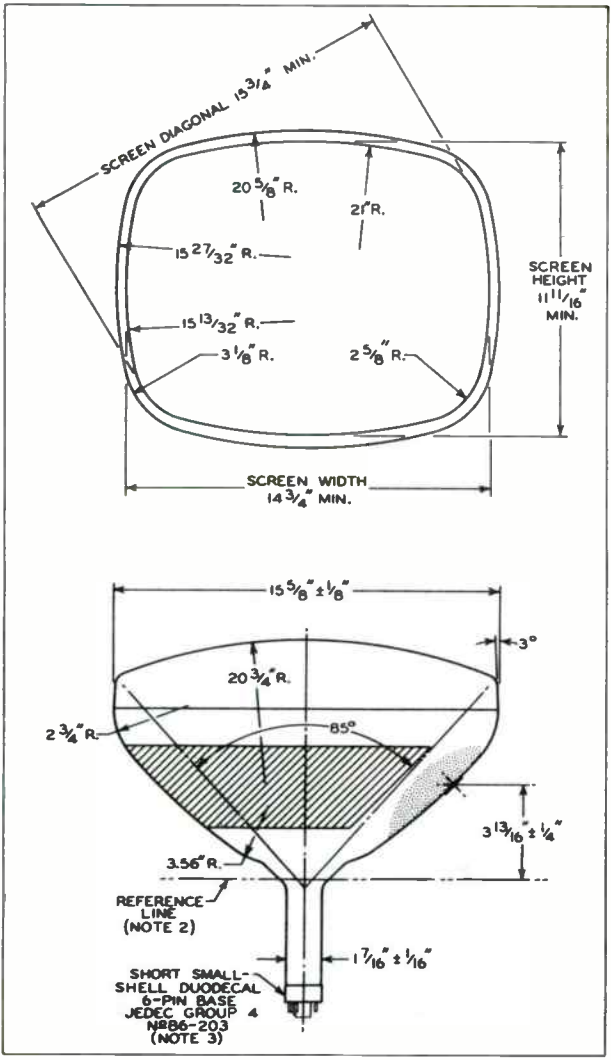
17CFP4

PICTURE TUBE



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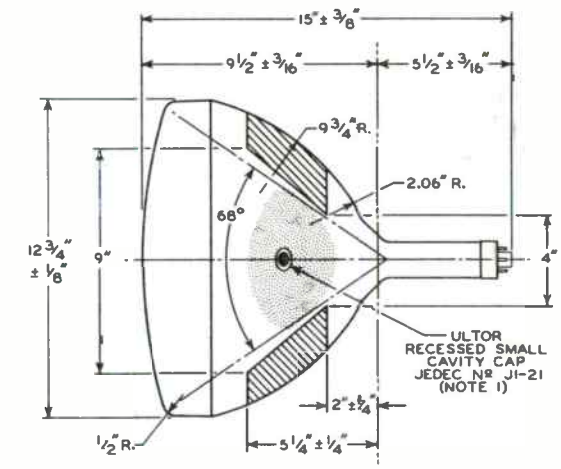
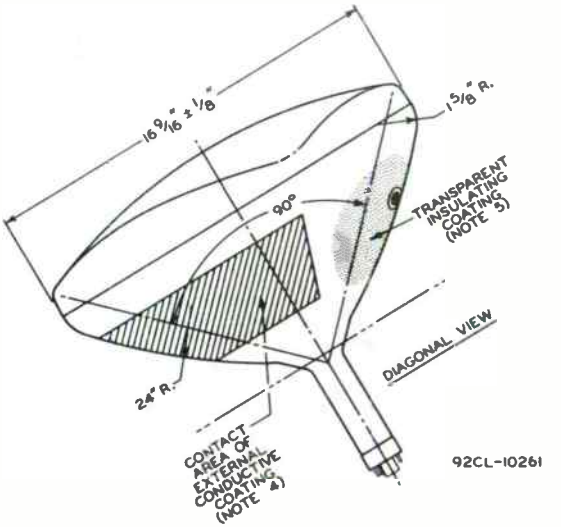
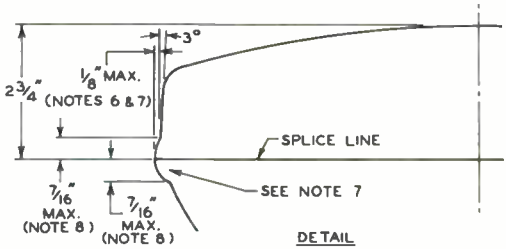
PICTURE TUBE





17CFP4

PICTURE TUBE



DETAIL

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 ± 3D°. 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. 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.

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.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED 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 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.

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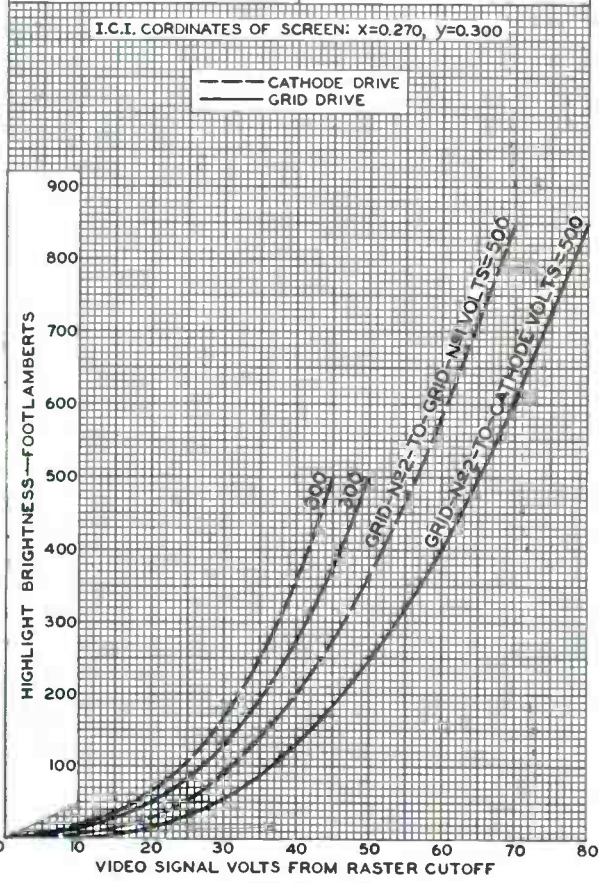
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 14"x 10½"	RASTER SIZE = 14"x 10½"

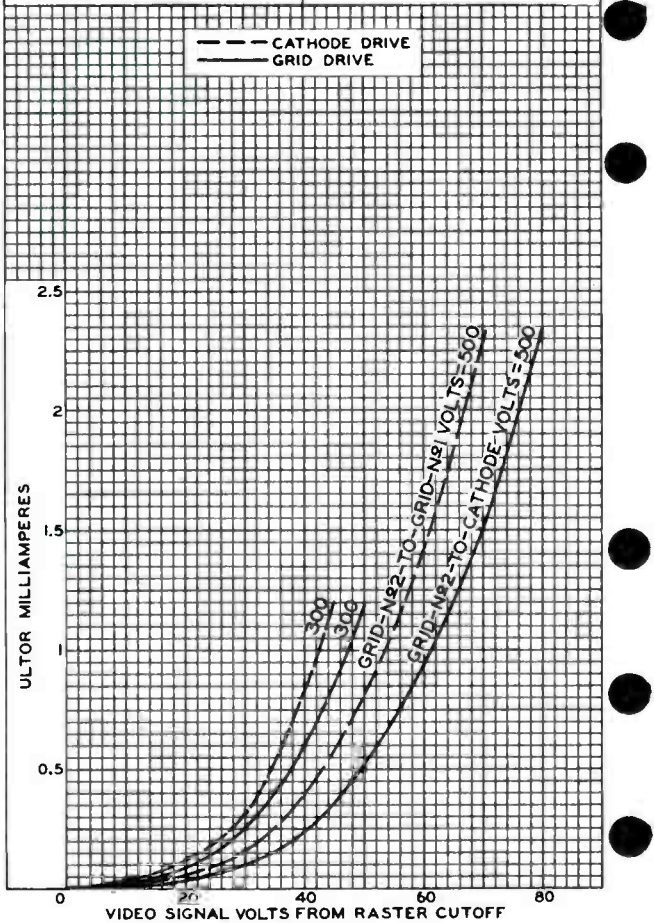


17CFP4

17CFP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS=12000 TO 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 6.3 VOLTS ULTOR VOLTS=12000 TO 16000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



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92CM-9243

17CP4

PICTURE TUBE

RECTANGULAR METAL-SHELL TYPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 ± 10% . . . . . amp ←

Faceplate, Spherical . . . . . Frosted Filterglass
Phosphor (For curves, see front of this Section) . P4—Sulfide Type
Deflection Angles (Approx.):
- Diagonal . . . . . 70°
- Horizontal . . . . . 66°
- Vertical . . . . . 50°

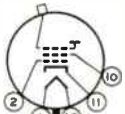
Electron Gun . . . . . Ion-Trap Type Requiring External Single-Field Magnet

Tube Dimensions:
- Maximum overall length . . . . . 19"
- Greatest width at lip. . . . . 15-15/16" ± 1/8"
- Greatest height at lip . . . . . 12-1/4" ± 1/8"
- Diagonal at lip. . . . . 16-13/16" ± 3/16"
- Neck length. . . . . 7-3/16" ± 3/16"
- Radius of curvature of faceplate (External surface) . . . . . 30"

Screen Dimensions (Minimum): ←
- Greatest width . . . . . 14-3/8"
- Greatest height. . . . . 10-11/16"
- Diagonal . . . . . 15-1/4"

Operating Position . . . . . Any
Ultor Terminal . . . . . Metal-Shell Lip
Base . . Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57) ←
Basing Designation for BOTTOM VIEW . . . . . 12D ←

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 Ratings, *Design-Center Values:*

ULTOR VOLTAGE.	16000 max.	volts
GRID-No.2 VOLTAGE.	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value.	125 max.	volts
Positive-bias value.	0 max.	volts
Positive-peak value.	2 max.	volts

←Indicates a change.

17CP4

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

SHORT RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 5%	ma
Heater Warm-Up Time (Average)	11	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.	1400 max. 900 min.	μμf μμf

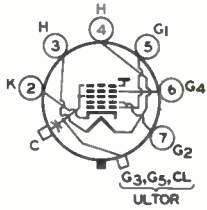
Electron Gun . . . . . Type Requiring No Ion-Trap Magnet

Optical:

Faceplate . . . . . Filter-glass
Light transmission (Approx.) 77%
Phosphor (For Curves, see front of this Section) . P4—Sulfide Type, Aluminized

Mechanical:

Operating Position . . . . . Any
Weight (Approx.) . . . . . 10 lbs
Overall Length . . . . . 12-5/16" ± 5/16"
Neck Length . . . . . 5-3/16" ± 3/16"
Projected Area of Screen . . . . . 155 sq. in.
External Conductive Coating:
Type . . . . . Modified Band
Contact area for grounding . . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines* and *Bulb J132-1/2 A/B* sheets at the front of this section
Cap . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . . . . Special 6-Pin (JEDEC No.B6-185)
Basing Designation for BOTTOM VIEW 7FA



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, *Design-Maximum Values:*

ULTOR VOLTAGE	17600 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 peak value	220 max.	volts
Negative bias value	154 max.	volts
Positive bias value	0 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 seconds.	450 max.	volts
After equipment warm-up period. . . .	200 max.	volts
Heater positive with respect to cathode.	200 max.	volts

Typical Operating Conditions:

With ultor voltage of	*14000*	*volts*
and grid-No.2 voltage of	*300*	*volts*
Grid-No.4 Voltage for focus	-50 to +350	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

17CYP4

PICTURE TUBE

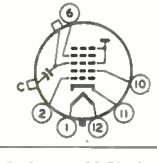
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.6	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	1500 max. / 1000 min.	μμf
Faceplate, Spherical	Filterglass	
Light transmission (Approx.)	77%	
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized	
Fluorescence	White	
Phosphorescence	White	
Persistence	Medium-Short	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	90°	
Horizontal	85°	
Vertical	68°	
Electron Gun	Type Requiring No Ion-Trap Magnet	
Tube Dimensions:		
Overall length	14" ± 3/8"	
Greatest width	15-5/8" ± 1/8"	
Greatest height	12-3/4" ± 1/8"	
Diagonal	16-9/16" ± 1/8"	
Neck length	4-1/2" ± 3/16"	
Radius of curvature of faceplate (External surface)	20-3/4"	
Screen Dimensions (Minimum):		
Greatest width	14-3/4"	
Greatest height	11-11/16"	
Diagonal	15-3/4"	
Projected area	155 sq. in.	
Weight (Approx.)	10 lbs	
Operating Position	Any	
Cap	Recessed Small Cavity (JEDEC No.J1-21)	
Bulb	J132-1/2 C1/D1	
Base	Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)	
Basing 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



Cap – U'tor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

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17CYP4
PICTURE TUBE

GRID-DRIVE▲ SERVICE

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

Maximum and Minimum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000	max.	volts
	12000*	min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:			
Positive value	1000	max.	volts
Negative value	500	max.	volts
GRID-No.2 VOLTAGE	500	max.	volts
GRID-No.1 VOLTAGE:			
Negative-peak value	200	max.	volts
Negative-bias value	140	max.	volts
Positive-bias value	0	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 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 voltage (E_{c_3k}) between 12000 and 16000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts*

Grid-No.4 Voltage for focus	−50 to +350	volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

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	−50 to +350	volts
Grid-No.1 Voltage for visual extinction of focused raster	−28 to −72	volts

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PICTURE TUBE

Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	28 to 72	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:*

ULTOR-TO-GRID-No.1 VOLTAGE	16000 max. 12000● min.	volts 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	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	140 max.	volts
Negative-bias value	0 max.	volts
Negative-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.	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.1 voltage ($E_{c_5g_1}$) between 12000● and 16000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 225 and 640 volts

Grid-No.4-To-Grid-No.1 Voltage for focus§	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (Ekg_1) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for Ekg_1 except video drive is a negative value	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

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17CYP4

PICTURE TUBE

Example 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.	28 to 60	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value.	-28 to -60	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 minimum. The equivalent *absolute minimum* ultor (or ultor-to-grid-No.1) voltage is 11,000 volts, below which the serviceability of the 17CYP4 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 voltage required for optimum focus of any individual tube will have a value between -50 and +350 volts independent of ultor current and will remain essentially constant for values of ultor voltage or grid-No.2 voltage within design ranges shown for these items.

§ The grid-No.4-to-grid-No.1 voltage required for optimum focus of any individual tube will have a value between 0 and 400 volts independent of ultor current and will remain essentially constant for values of ultor-to-grid-No.1 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 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.

OPERATING CONSIDERATIONS

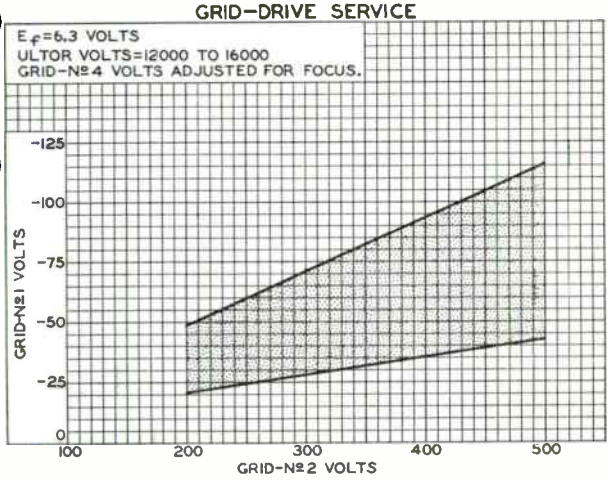
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 17CYP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion 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

17CYP4

RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



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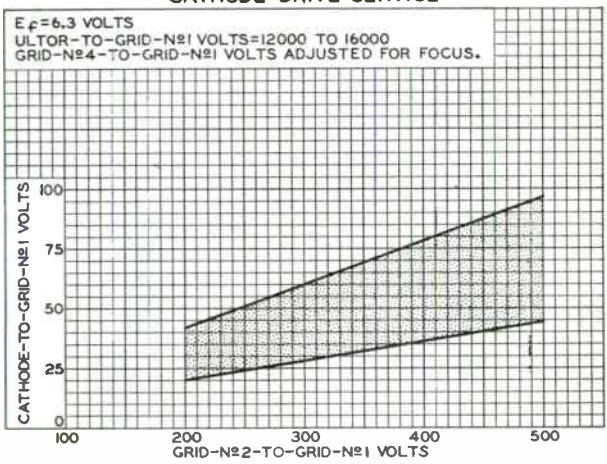
CATHODE-DRIVE SERVICE



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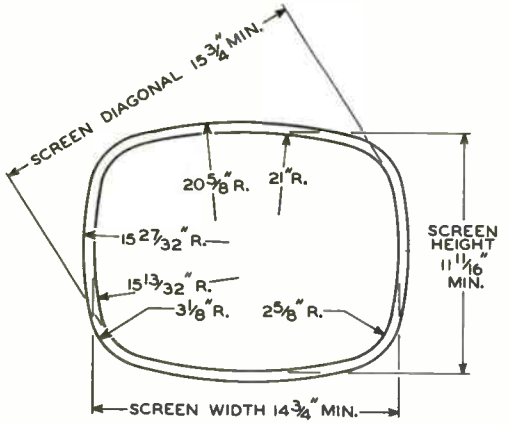
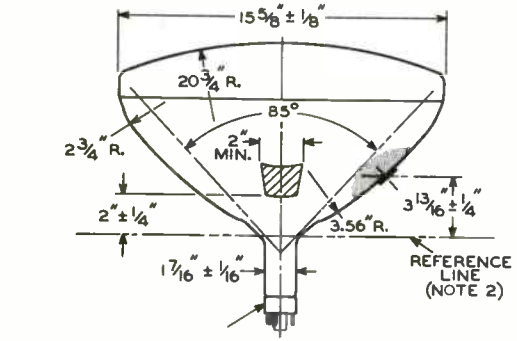
17CYP4
PICTURE TUBE





SHORT SMALL-SHELL DUODECAL
6-PIN BASE
JEDEC GROUP 4, №86-203
(NOTE 3)

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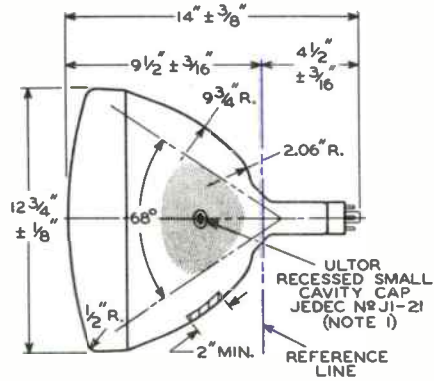
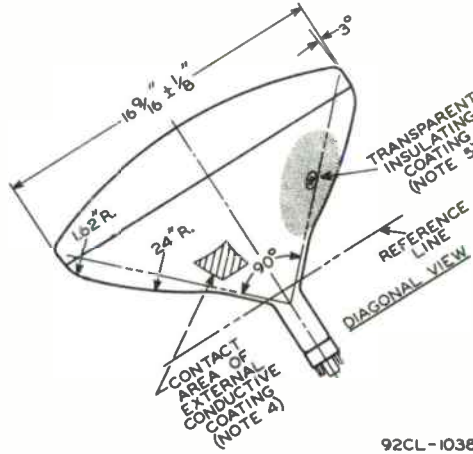
17CYP4

PICTURE TUBE





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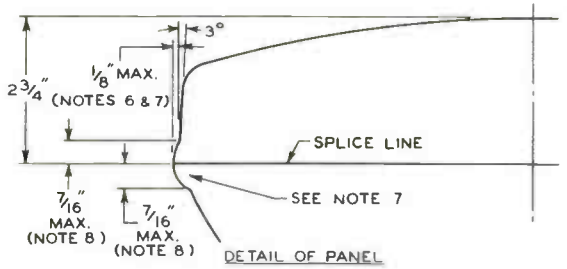
17CYP4

PICTURE TUBE



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 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 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 INDICATED 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 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.

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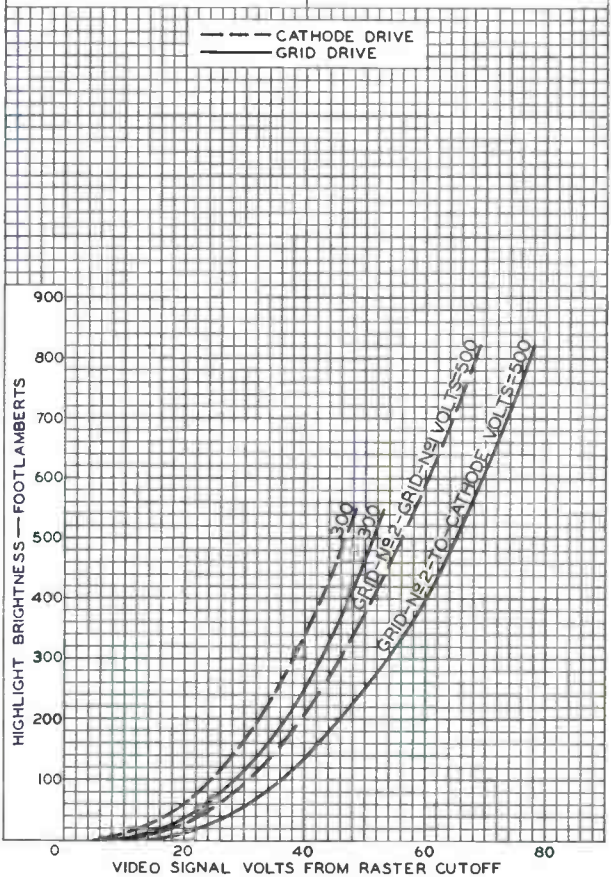
RCA

17CYP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
Ef = 6.3 VOLTS	Ef = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 14" x 10½"	RASTER SIZE = 14" x 10½"



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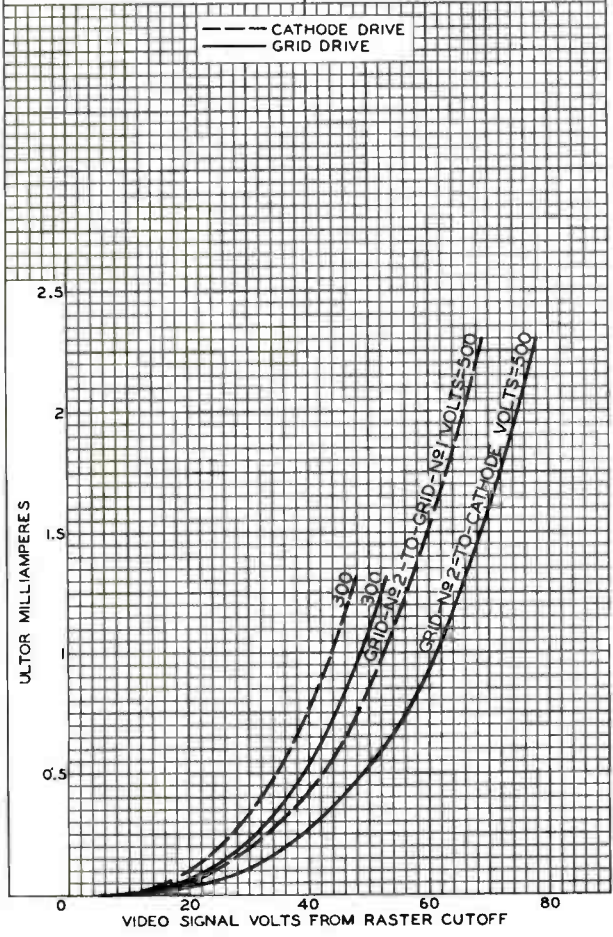
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS = 12000 TO 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 6.3 VOLTS ULTOR VOLTS = 12000 TO 16000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



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17DAP4
PICTURE TUBE

SHORT RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

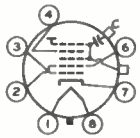
With heater having controlled warm-up time

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	2.68 ± 10%	volts
Current at 2.68 volts	0.45	amp
Warm-up time (Average)	11	sec
Capacitance between External Conductive Coating and Ultor	1400 max. 900 min.	μμf μμf
Faceplate, Spherical	Filterglass	
Phosphor (For curves, see front of this section)	P4—Sulfide Type Aluminized	
Deflection Angles (Approx.):		
Diagonal	110°	
Horizontal	105°	
Vertical	87°	
Electron Gun	Type Requiring No Ion-Trap Magnet	
Tube Dimensions:		
Overall length	10-11/16" ± 3/16"	
Greatest width	15-5/8" ± 1/8"	
Greatest height	12-3/4" ± 1/8"	
Diagonal	16-9/16" ± 1/8"	
Neck length	3-9/16" ± 1/16"	
Radius of curvature of faceplate (External surface)	20-3/4"	
Screen Dimensions (Minimum):		
Greatest width	14-3/4"	
Greatest height	11-11/16"	
Diagonal	15-3/4"	
Projected area	155 sq. in.	
Operating Position	Any	
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	BJK	

Pin 1 – Heater
Pin 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



Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	850 max.	volts
Negative value	630 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts

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PICTURE TUBE

GRID-No.1 VOLTAGE:		
Negative-peak value	360 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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

17DKP4

PICTURE TUBE

SHORT 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 . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 . . . . . amp
- Warm-up time (Average) . 11 . . . . . sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of Receiving Tube Section.

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . 6 μμf
- Cathode to all other electrodes . . . . 5 μμf
- External conductive coating to ultor . . {1500 max. μμf / {1000 min. μμf

Faceplate, Spherical . . . . . Filterglass
Light transmission (Approx.) 76%
Phosphor (For Curves, see front of this Section) . P4—Sulfide Type Aluminized
- Fluorescence . . . . . White
- Phosphorescence . . . . . White
- Persistence . . . . . Short

Focusing Method . . . . . Electrostatic
Deflection Method . . . . . Magnetic
Deflection Angles (Approx.):
- Diagonal . . . . . 110°
- Horizontal . . . . . 105°
- Vertical . . . . . 87°

Electron Gun . . . . . Type Requiring No Ion-Trap Magnet
Tube Dimensions:
- Overall length . . . . . 10-11/16" ± 1/4"
- Greatest width . . . . . 15-5/8" ± 1/8"
- Greatest height . . . . . 12-3/4" ± 1/8"
- Diagonal . . . . . 16-9/16" ± 1/8"
- Neck length . . . . . 3-9/16" ± 1/8"

Screen Dimensions (Minimum):
- Greatest width . . . . . 14-3/4"
- Greatest height . . . . . 11-11/16"
- Diagonal . . . . . 15-3/4"
- Projected area . . . . . 155 sq. in.

Weight (Approx.) . . . . . 10 lbs
Operating Position . . . . . Any
Cap . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Bulb J132-1/2 A1/B1
Socket . . . . . Ucinite Part No.115446, or equivalent
Base . . . . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)

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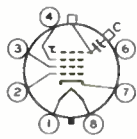
PICTURE TUBE

Basing Designation for BOTTOM VIEW. 8JR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.3
Pin 6 - Internal Connection—Do Not Use
Pin 7 - Cathode



Pin 8 - Heater
Cap - Ultor (Grid No.4, Collector)
C - External Conductive Coating

GRID-DRIVE[A] SERVICE

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

Maximum and Minimum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
	12000* min.	volts
GRID-No.3 VOLTAGE	650 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
	300 min.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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 voltage (E_{c_4k}) between 12000 and 16000 volts and grid-No.2 voltage (E_{c_2k}) between 400 and 550 volts

Grid-No.3 Voltage for focus§	0 to 400	volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.3 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa

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PICTURE TUBE

Field Strength of Adjustable Centering Magnet. . .	0 to 12		gausses

Examples of Use of Design Ranges:

With ultor voltage of / *and grid-No.2 voltage of*	*16000* / *400*	*16000* / *500*	*volts* / *volts*
Grid-No.3 Voltage for focus	0 to 400	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster	-34 to -63	-43 to -78	volts
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	34 to 63	43 to 78	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:*

ULTOR-TO-GRID-No.1 VOLTAGE.	16000	max.	volts
	12000●	min.	volts
GRID-No.3-TO-GRID-No.1 VOLTAGE.	650	max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	690	max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	550	max.	volts
	300	min.	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:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds.	410	max.	volts
After equipment warm-up period. . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_1g_1}$) between 12000 and 16000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 400 and 690 volts

Grid-No.3-to-Grid-No.1 Voltage for focus§.	0 to 400	volts

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PICTURE TUBE

Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster.	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*		
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative).	Same value as determined for E_{kg_1} except video drive is a negative voltage		
Grid-No.3 Current.	-25 to +25		μa
Grid-No.2 Current.	-15 to +15		μa
Field Strength of Adjustable Centering Magnet♦ . .	0 to 12		gausses
Examples of Use of Design Ranges:			
With ultor-to-grid-No.1 voltage of	*16000*	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*400*	*500*	*volts*
Grid-No.3-to-Grid-No.1 Voltage for focus.	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	34 to 56	41 to 69	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value.	-34 to -56	-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 minimum* ultor- or ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 17DKP4 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-microampere change in ultor current. Because the 17DKP4 has a narrow depth of focus, it is necessary to

17DKP4

PICTURE TUBE

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.

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 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 17DKP4 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 wher required.

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

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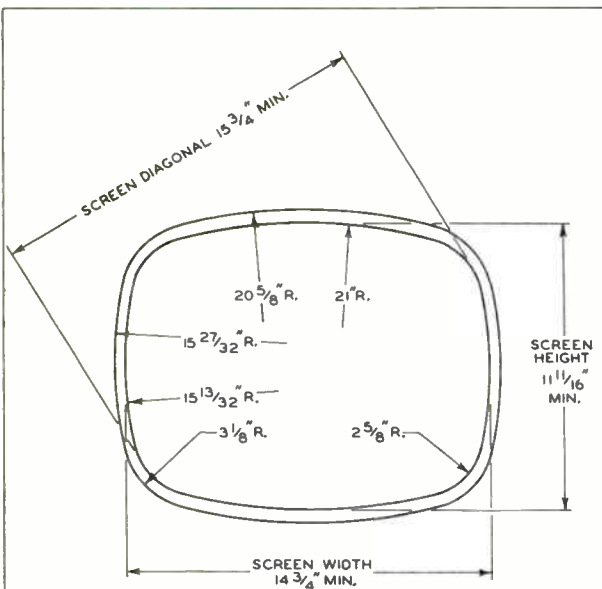
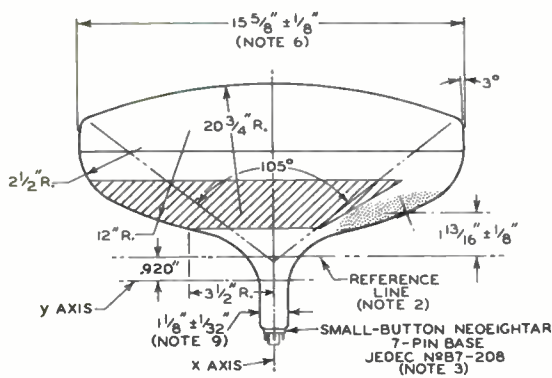
PICTURE TUBE





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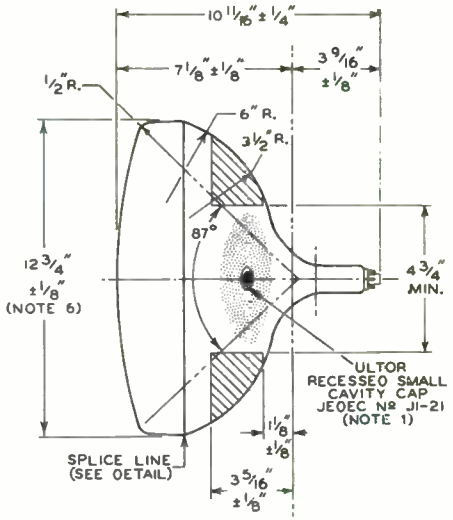

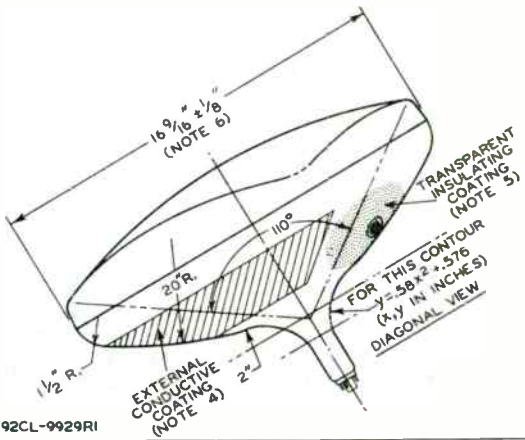

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17DKP4

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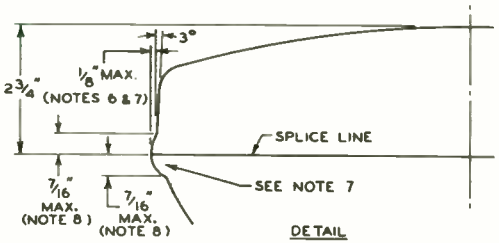


DETAIL

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 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, 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 INDICATED 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 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. SUPPORTS MUST BE SPACED FROM THE TUBE BY THE USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

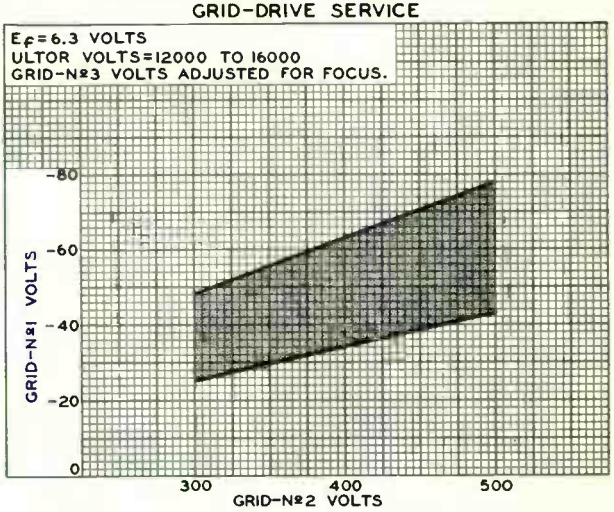
NOTE 9: NECK DIAMETER IS MAINTAINED TO AT LEAST 2-7/16" FROM REFERENCE LINE.

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

17DKP4

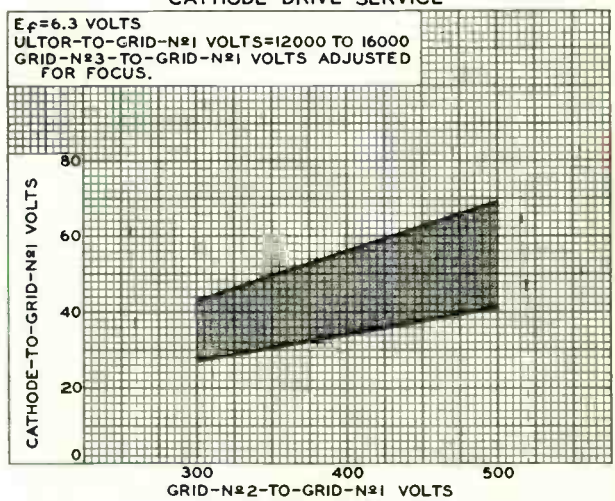
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



92CS-9930

CATHODE-DRIVE SERVICE



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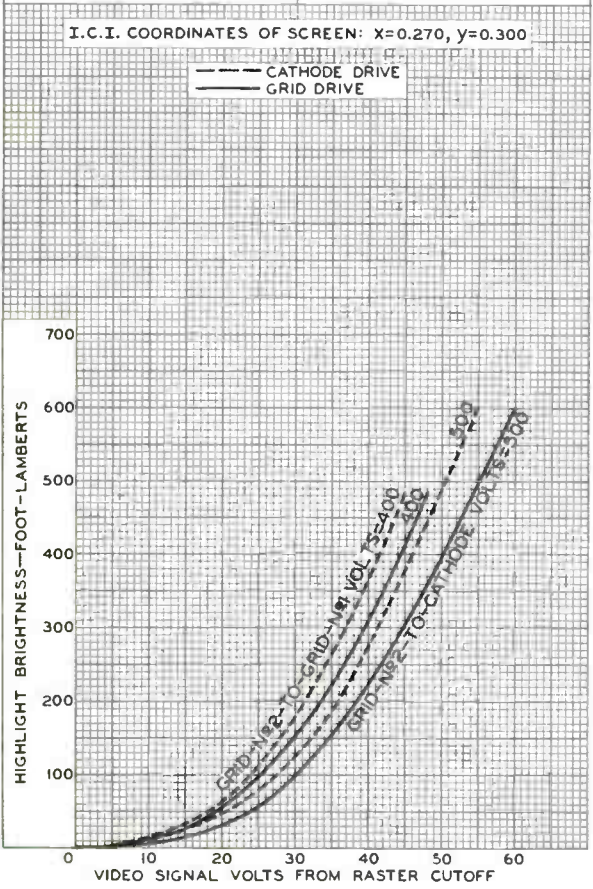
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17DKP4

AVERAGE DRIVE CHARACTERISTICS

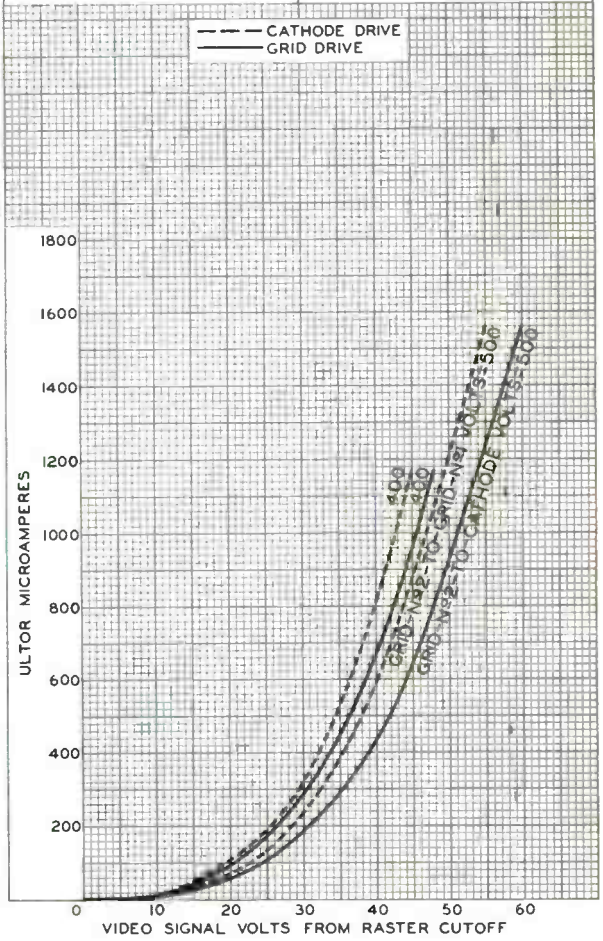
CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 14" x 10½"	RASTER SIZE = 14" x 10½"



17DKP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS = 12000 TO 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 6.3 VOLTS ULTOR VOLTS = 12000 TO 16000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



Picture Tube

SHORT RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° MAGNETIC DEFLECTION**
LOW GRID-No.2 VOLTAGE — **CATHODE-DRIVE TYPE**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	450 ± 5%	ma
Heater Warm-Up Time (Average)	11	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	1700 max. 1200 min.	μμf μμf

Electron Gun . . . . . .Type Requiring No Ion-Trap Magnet

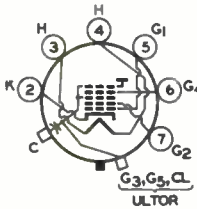
Optical:

Faceplate . . . . . .Filterglass
Light transmission (Approx.) 77%
Phosphor (For Curves, see front of this Section) . P4—Sulfide Type, Aluminized

Mechanical:

Operating Position . . . . . .Any
Weight (Approx.) . . . . . 10 lbs
Overall Length . . . . . 12-1/8" ± 1/4"
Neck Length . . . . . 5" ± 1/8"
Projected Area of Screen . . . . . 155 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 J132-1/2 A/B* 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 BOTTOM VIEW 7FA

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-TO-GRID-No.1 VOLTAGE.	17600 max.	volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value.	1100 max.	volts
Negative value.	550 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE. . . .	70 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	150 max.	volts
Negative 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.	volts
After equipment warm-up period. . .	200 max.	volts
Heater positive with respect to cathode.	200 max.	volts

Typical Operating Conditions:

With ultor-to-grid-No.1 voltage of	*14500*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*50*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	-200 to +350	volts
Cathode-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

Picture Tube

SHORT RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 110° MAGNETIC DEFLECTION
INTERNAL MAGNETIC SHIELD

With Heater Having Controlled Warm-Up Time

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 .	1400 max.	pf
	900 min.	pf
Heater Current at 2.68 volts	450 ± 45	ma
Heater Warm-Up Time (Average).	11	seconds

Electron Gun . . . . . .Type Requiring No Ion-Trap Magnet

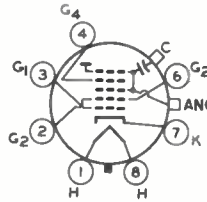
Optical:

Phosphor (For Curves, see front of this Section) . .P4—Sulfide Type, Aluminized
Faceplate, Spherical . . . . . .Filterglass
Light transmission (Approx.) 77%

Mechanical:

Weight (Approx.) . . . . . 10 lbs
Overall Length . . . . . 10-13/16" ± 3/16"
Neck Length. . . . . 3-11/16" ± 1/16"
Projected Area of Screen . . . . . 155 sq. in.
External Conductive Coating:
Type . . . . . Modified-Band
Contact area for grounding . . . . . .Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J132-1/2 A/B* sheets 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 8JK

Pin 1 – Heater
Pin 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



Cap – Anode (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	17600 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	950 max.	volts
Negative value	700 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
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	2.9 max. 2.4 min.	volts 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	14000	volts
Grid-No.4 Voltage	100 to 500	volts
Grid-No.2 Voltage	300	volts
Grid-No.1 Voltage for visual extinction of focused raster	-35 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

17DSP4
PICTURE TUBE

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)	6.3	volts
Current	0.6	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	1500 max. 1000 min.	μμf μμf
Faceplate, Spherical	Filterglass	
Light transmission (Approx.)	78%	
Phosphor (For curves, see front of this section)	P4—Sulfide Type Aluminized	
Fluorescence	White	
Phosphorescence	White	
Persistence	Medium-Short	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	110°	
Horizontal	105°	
Vertical	87°	
Electron Gun	Type Requiring No Ion-Trap Magnet	
Tube Dimensions:		
Overall length	11-1/4" ± 3/16"	
Greatest width	15-5/8" ± 1/8"	
Greatest height	12-3/4" ± 1/8"	
Diagonal	16-9/16" ± 1/8"	
Neck length	4-1/8" ± 1/8"	
Radius of curvature of faceplate (External surface)	20-3/4"	
Screen Dimensions (Minimum):		
Greatest width	14-3/4"	
Greatest height	11-11/16"	
Diagonal	15-3/4"	
Projected area	155 sq. in.	
Weight (Approx.)	10 lbs	
Operating Position	Any	
Cap	Recessed Small Cavity (JEDEC No.J1-21)	
Bulb	J132-1/2 A1/B1	
Socket	Ucinite Part No.115446, or equivalent	

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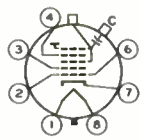
PICTURE TUBE

Base. . . . . Small-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



Cap – Ultor (Grid 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-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
	12000* min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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 voltage (E_{c_5k}) between 12000 and 18000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts*

Grid-No.4 Voltage for focus§	0 to 400 volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage

17DSP4

PICTURE TUBE

Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gauss

Examples of Use of Design Ranges:

With ultor voltage of / *and grid-No.2 voltage of*	*16000* / *300*	*16000* / *400*	*volts* / *volts*
Grid-No.4 Voltage for focus	0 to 400	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster	−38 to −72	−45 to −90	volts
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	38 to 72	45 to 90	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:*

ULTOR-TO-GRID-No.1 VOLTAGE	18000	max.	volts
	12000®	min.	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	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	140	max.	volts
Negative-bias value	0	max.	volts
Negative-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.	volts
After equipment warm-up period	180	max.	volts
Heater positive with respect to cathode	180	max.	volts

17DSP4

PICTURE TUBE

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_{3g_1}}$) between 12000 and 18000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_{2g_1}}$) between 225 and 640 volts*

Grid-No.4-to-Grid-No.1 Voltage for focus§	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (Ekg_{g_1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for Ekg_{g_1} except video drive is a negative value	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gauss

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	35 to 63	43 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	−35 to −63	−43 to −78	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 minimum* ultor (or ultor-to-grid-No.1) voltage is 11,000 volts, below which the serviceability of the 17DSP4 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.4-to-grid-No.1) voltage required for optimum focus of any individual tube will have a value between 0 and 400 volts 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.

17DSP4

PICTURE TUBE

• Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/8°. 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

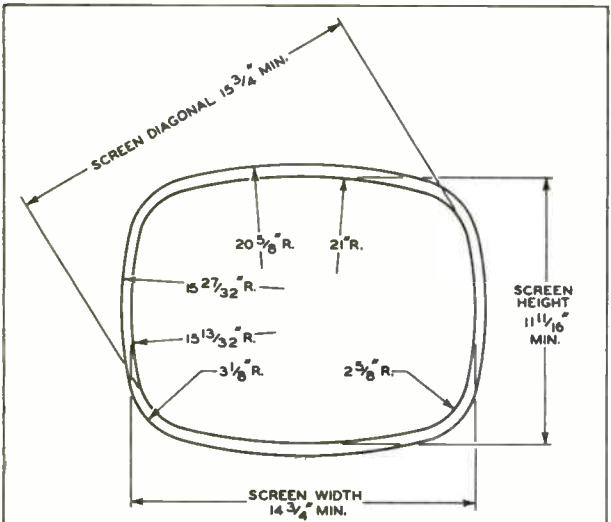
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 17DSP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

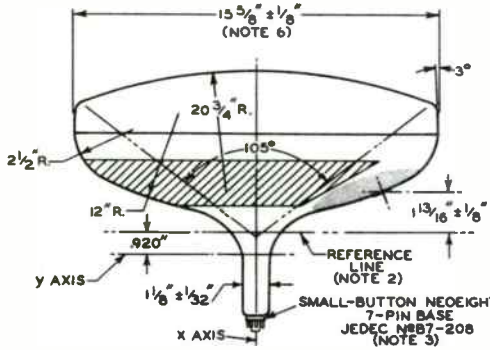
For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section

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

17DSP4

PICTURE TUBE



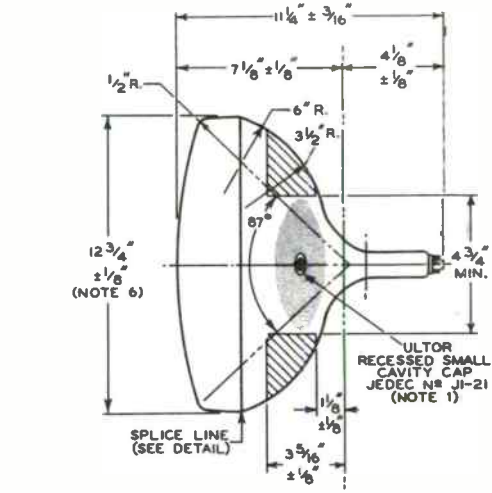


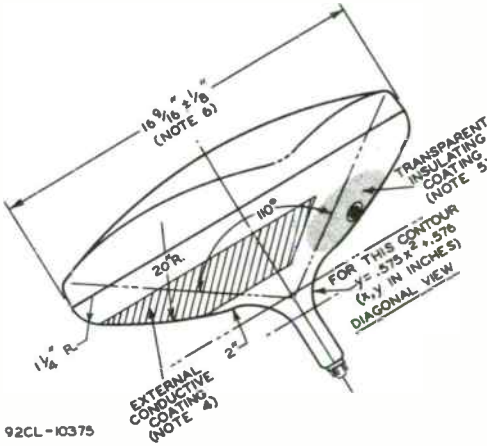
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

17DSP4

PICTURE TUBE





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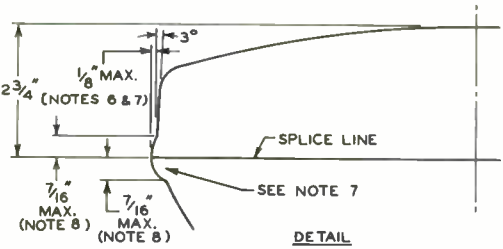
17DSP4

PICTURE TUBE



DETAIL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THRDUGH 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 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 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 INDICATED 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 DIMENSIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.

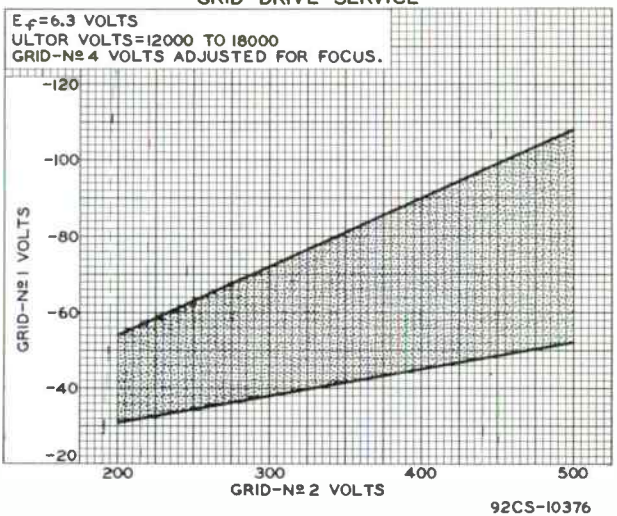
NOTE 8: THE TUBE SHOULD BE SUPPORTED ON BOTH SIDES OF THE BULGE. THE MECHANISM USED SHOULD PROVIDE CLEARANCE FOR THE MAXIMUM DIMENSIONS OF THE BULGE. SUPPORTS MUST BE SPACED FROM THE TUBE BY THE USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

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

17DSP4

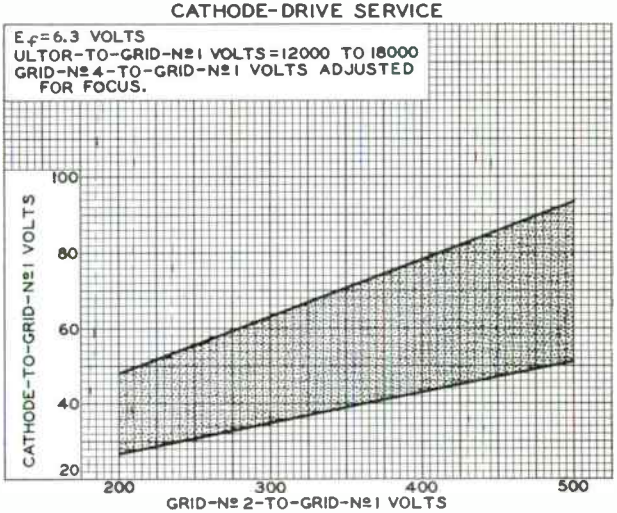
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



92CS-10376

CATHODE-DRIVE SERVICE



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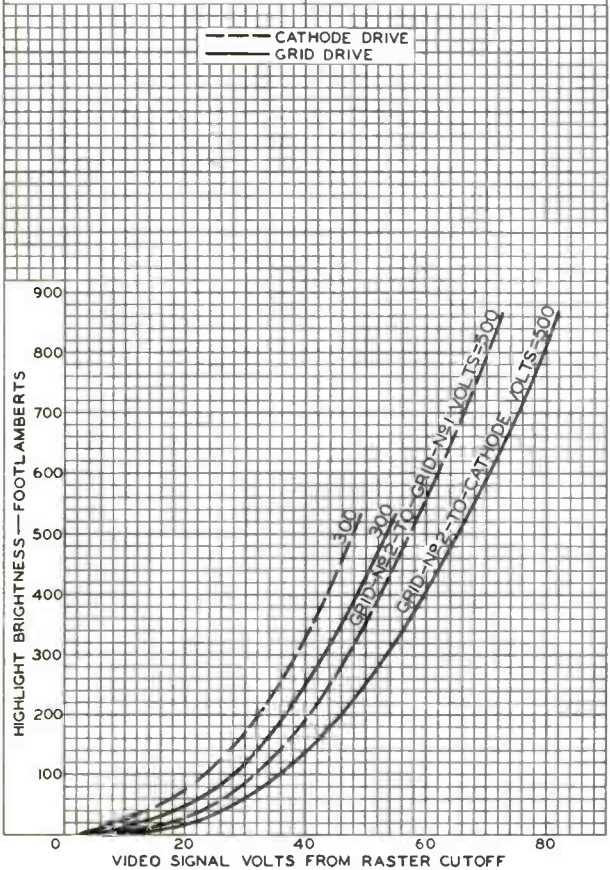
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17DSP4

17DSP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 14" x 10½"	RASTER SIZE = 14" x 10½"



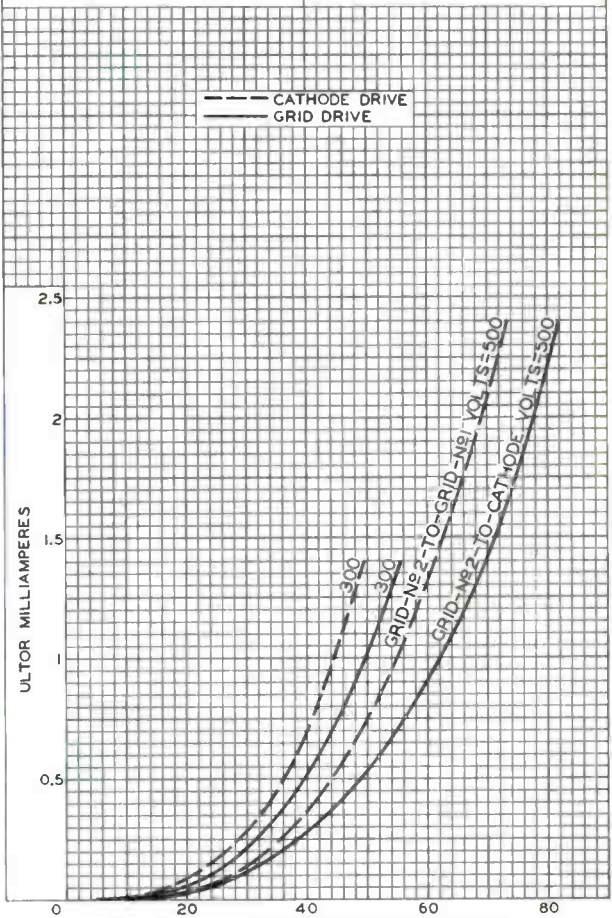
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10380

17DSP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f=6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS=12000 TO 18000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f= 6.3 VOLTS ULTOR VOLTS=12000 TO 18000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-10382

Picture Tube

SHORT RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

DATA

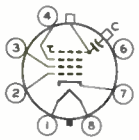
General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current at 6.3 volts	0.45	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	1500 max. / 1000 min.	μμf
Faceplate, Spherical	Filterglass	
Light transmission (Approx.)	77%	
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized	
Fluorescence	White	
Phosphorescence	White	
Persistence	Medium Short	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	110°	
Horizontal	105°	
Vertical	87°	
Electron Gun	Type Requiring No Ion-Trap Magnet	
Tube Dimensions:		
Overall length	10-11/16" ± 1/4"	
Greatest width	15-5/8" ± 1/8"	
Greatest height	12-3/4" ± 1/8"	
Diagonal	16-9/16" ± 1/8"	
Neck length	3-9/16" ± 1/8"	
Radius of curvature of faceplate (External surface)	20-3/4"	
Screen Dimensions (Minimum):		
Greatest width	14-3/4"	
Greatest height	11-11/16"	
Diagonal	15-3/4"	
Projected area	155 sq. in.	
Weight (Approx.)	10 lbs	
Operating Position	Any	
Cap	Recessed Small Cavity (JEDEC No.J1-21)	
Bulb	J132-1/2 A/8	
Socket	Ucinite Part No.115446, or equivalent	
Base	Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)	

17DXP4

Basing Designation for BOTTOM VIEW. 8JR

Pin 1 – Heater
Pin 2 – Grid No.1
Pin 3 – Grid No.2
Pin 4 – Grid No.3
Pin 6 – Internal Connection—Do Not Use
Pin 7 – Cathode



Pin 8 – Heater
Cap – Ultor (Grid No.4, Collector)
C – External Conductive Coating

GRID-DRIVE▲ SERVICE

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

Maximum and Minimum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
	12000* min.	volts
GRID-No.3 (FOCUSING) VOLTAGE	650 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
	300 min.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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 voltage (E_{c_4k}) between 12000 and 16000 volts and grid-No.2 voltage (E_{c_2k}) between 400 and 550 volts

Grid-No.3 Voltage for focus§	0 to 400	volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	See *Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.3 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa

Field Strength of Adjustable Centering Magnet . .	0 to 12	gausses

Examples of Use of Design Ranges:

With ultor voltage of / *and grid-No.2 voltage of*	*16000* / *400*	*16000* / *500*	*volts* / *volts*
Grid-No.3 Voltage for focus.	0 to 400	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster.	−34 to −63	−43 to −78	volts
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value.	34 to 63	43 to 78	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:*

ULTOR-TO-GRID-No.1 VOLTAGE.	16000	max.	volts
	12000*	min.	volts
GRID-No.3-TO-GRID-No.1 (FOCUSING) VOLTAGE	650	max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	690	max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	550	max.	volts
	300	min.	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:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds.	410	max.	volts
After equipment warm-up period. . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_U g_1}$) between 12000 and 16000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2 g_1}$) between 400 and 690 volts

Grid-No.3-to-Grid-No.1 Voltage for focus§.	0 to 400	volts

Cathode-to-Grid-No.1 Voltage (Ek_{g_1}) for visual extinction of focused raster.	See *Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for Ek_{g_1} except video drive is a negative voltage	
Grid-No.3 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet♦. .	0 to 12	gauses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*16000*	*volts*
and grid-No.2 to-grid-No.1 voltage of	*400*	*500*	*volts*
Grid-No.3 to-Grid-No.1 Voltage for focus	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster.	34 to 56	41 to 69	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	−34 to −56	−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 minimum* ultor- or ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 17DXP4 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-microampere change in 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.

♦ 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 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.

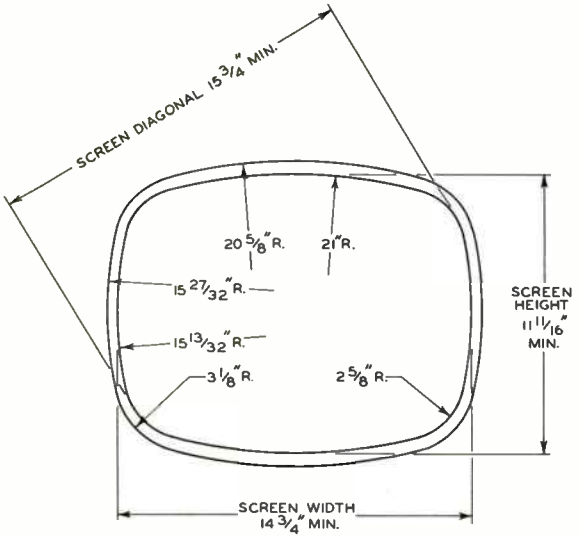
■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

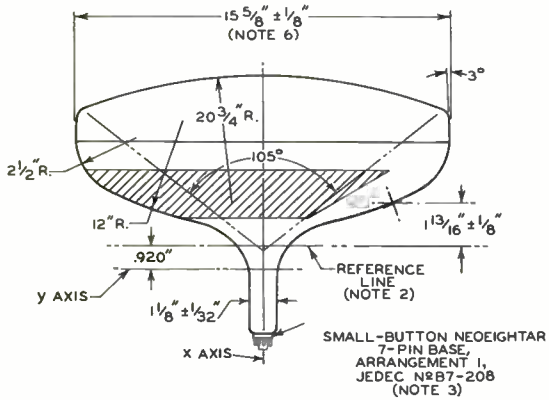
OPERATING CONSIDERATIONS

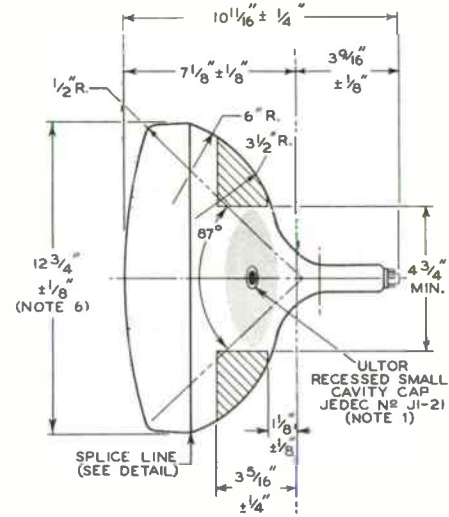
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 17DXP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

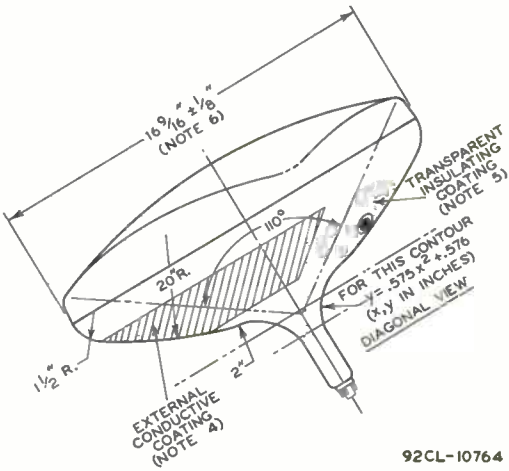
For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section

17DXP4









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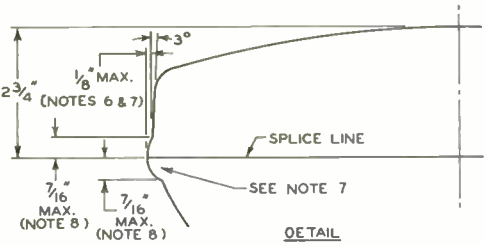


DETAIL

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 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, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

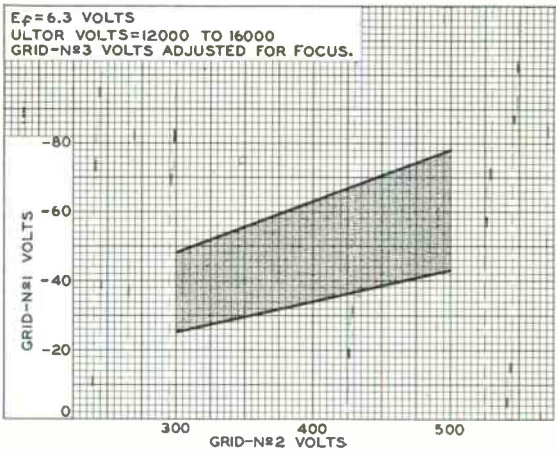
NOTE 6: MEASURED 2-9/32" ± 1/32" FROM THE PLANE TANGENT TO THE SURFACE OF THE FACEPLATE AT THE TUBE AXIS.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED 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 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. 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



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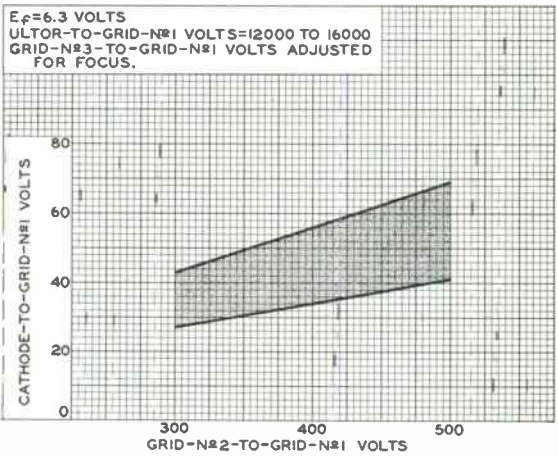
Cathode-Drive Service



92CS-9931

17GP4

PICTURE TUBE

RECTANGULAR METAL-SHELL TYPE

ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 ± 10% . . . . . .amp ←

Faceplate, Spherical . . . . . .Frosted Filterglass
Phosphor (For curves, see front of this Section) . . P4—Sulfide Type
Deflection Angles (Approx.):
- Diagonal . . . . . 70°
- Horizontal . . . . . 66°
- Vertical . . . . . 50°

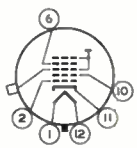
Electron Gun . . . . . .Ion-Trap Type Requiring External Single-Field Magnet

Tube Dimensions:
- Maximum overall length . . . . . 19-5/16"
- Greatest width at lip. . . . . 15-15/16" ± 1/8"
- Greatest height at lip . . . . . 12-1/4" ± 1/8"
- Diagonal at lip. . . . . 16-13/16" ± 3/16"
- Neck length. . . . . 7-1/2" ± 3/16"
- Radius of curvature of faceplate (External surface). . 30" ←

Screen Dimensions (Minimum):
- Greatest width . . . . . 14-3/8"
- Greatest height. . . . . 10-11/16"
- Diagonal . . . . . 15-1/4"

Operating Position . . . . . .Any
Ultor Terminal . . . . . .Metal-Shell Lip
Base . . Small-Shell Duodecal 6-Pin (JETEC Group 4, No. B6-63) ←
- Basing Designation for BOTTOM VIEW . . . . . .12M ←

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



Metal-Shell Lip-Ultor (Grid No.3, Grid No.5, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE	5000 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

← Indicates a change.

17GP4

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

17HP4C

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
70° MAGNETIC DEFLECTION

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 . .	1500 max. 750 min.	pf pf
Heater Current at 6.3 volts.	600 ± 30	ma
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For curves, see front of this section).	P4—Sulfide Type, Aluminized
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	74%

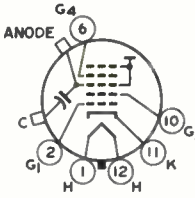
Mechanical:

Weight (Approx.)	18 lbs
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 and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J133 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)
Basing 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



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.	17500 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 peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts 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	14000	volts
Grid-No.4 Voltage	-56 to +310	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

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
70° MAGNETIC DEFLECTION

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	1500 max. 750 min.	pf pf
Heater Current at 6.3 volts	600 ± 30	ma
Electron Gun	Type Requiring No Ion-Trap Magnet	

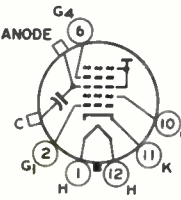
Optical:

Phosphor (For Curves, see front of this Section). P4—Sulfide Type, Aluminized
Faceplate, Cylindrical . . . . . Filterglass
Light transmission (Approx.) 66%

Mechanical:

Weight (Approx.) . . . . . 19 lbs
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 and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J139C/E* 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)
Basing 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



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	17500 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 peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode:		
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	14000	volts
Grid-No.4 Voltage	-56 to +310	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

17HP4 / 17RP4

PICTURE TUBE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

The 17HP4/17RP4 is the same as the 17HP4-B/17RP4-C except that it utilizes a *non-aluminized phosphor*.

17HP4-B/17RP4-C
PICTURE TUBE

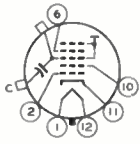
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp
Capacitance between External Conductive Coating and Ultor	1500 max. μμf; 750 min. μμf
Faceplate, Spherical	Filterglass
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized
Deflection Angles (Approx.):	
Diagonal	70°
Horizontal	65°
Vertical	50°
Electron Gun	Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:	
Overall length	19-3/16" ± 3/8"
Greatest width	15-25/64" ± 1/8"
Greatest height	12-9/32" ± 1/8"
Diagonal	16-5/8" ± 1/8"
Neck length	7-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)	27"
Screen Dimensions (Minimum):	
Greatest width	14-5/16"
Greatest height	11-1/8"
Diagonal	15-9/16"
Projected area	149 sq. in.
Operating Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Base	Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-63) ←
Basing Designation for BOTTOM VIEW	12L

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



Cap – Ultor (Grid No.3, Gric No.5, Collector)
C – External Conductive Coating

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max. volts
GRID-No.4 (FOCUSING) VOLTAGE:	
Positive value	1000 max. volts
Negative value	500 max. volts
GRID-No.2 VOLTAGE	500 max. volts

← Indicates a change.

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

17HP4-B/17RP4-C

PICTURE TUBE

GRID-No.1 VOLTAGE:		
Negative-peak value.	200 max.	volts
Negative-bias value.	140 max.	volts
Positive-bias value.	0 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 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

17LP4/17VP4
PICTURE TUBE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

The 17LP4/17VP4 is the same as the 17LP4-A/17VP4-B except that it utilizes a *non-aluminized phosphor.*

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

17QP4B

Picture Tube

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
70° MAGNETIC DEFLECTION

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	1500 max.	pf
	750 min.	pf
Heater Current at 6.3 volts	600 ± 60	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For curves, see front of this section). P4—Sulfide Type, Aluminized

Faceplate . . . . . Filterglass

Light transmission (Approx.) 74%

Mechanical:

Weight (Approx.)	29 lbs
Overall Length	19-3/16" ± 3/8"
Neck Length	7-1/2" ± 3/16"
Projected Area of Screen	183 sq. in.
External Conductive Coating:	
Type	Regular-Band
Contact area for grounding	Near Reference Line

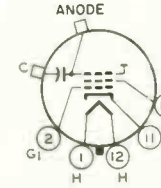
For Additional Information on Coatings, Dimensions, and Deflection Angles:

See *Picture-Tube Dimensional-Outlines and Bulb Japs C/E* sheets at front of this section

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

Base . . . . . Small-Shell Duodecal 5-Pin (JEDEC Group 4, No.B5-57)

Basing Designation for BOTTOM VIEW 12N



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	550 max.	volts

Grid-No.1 Voltage:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
Heater Voltage	6.9 max. 5.7 min.	volts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode:		
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	14000	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

17QP4

PICTURE TUBE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS MAGNETIC DEFLECTION

The 17QP4 is the same as the 17QP4-A except that it utilizes a *non-aluminized phosphor* and has a *maximum ultor-voltage rating of 16,000 volts* together with a *maximum grid-No.2-voltage rating of 410 volts.*

RCA

17QP4-A

PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 ± 10% . . . . . amp

Capacitance between External Conductive Coating and Ultor . . . . . 1500 max. μμf; 750 min. μμf

Faceplate, Cylindrical . . . . . Filterglass

Phosphor (For Curves, see front of this Section) . . P4—Sulfide Type Aluminized

Deflection Angles (Approx.):
- Diagonal . . . . . 70°
- Horizontal . . . . . 65°
- Vertical . . . . . 50°

Electron Gun . . . . . Ion-Trap Type Requiring External Single-Field Magnet

Tube Dimensions:
- Overall length . . . . . 19-3/16" ± 3/8"
- Greatest width . . . . . 15-25/64" ± 1/8"
- Greatest height . . . . . 12-9/32" ± 1/8"
- Diagonal . . . . . 16-5/8" ± 1/8"
- Neck length . . . . . 7-1/2" ± 3/16"
- Radius of curvature of faceplate (External horizontal surface) . . . . . 27"

Screen Dimensions (Minimum):
- Greatest width . . . . . 14-1/4"
- Greatest height . . . . . 10-3/4"
- Diagonal . . . . . 15-5/16"
- Projected area . . . . . 140 sq. in.

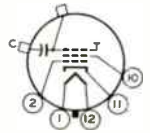
Operating Position . . . . . Any

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

Base . . Small-Shell Duodecal 5-Pin (JETEC Group 4, No. B5-57) ←

Basing Designation for BOTTOM VIEW 12N

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



Cap – Ultor (Grid No.3, Collector)
C – External Conductive Coating

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

← Indicates a change.

17QP4-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	150 max.	volts
Heater positive with respect to cathode.	150 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

17TP4

PICTURE TUBE

RECTANGULAR METAL-SHELL TYPE

LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 ± 10% . . . . . amp ←

Faceplate, Spherical . . . . . Frosted Filterglass
Phosphor (For Curves, see front of this Section) . . P4—Sulfide Type
Deflection Angles (Approx.):
- Diagonal . . . . . 70°
- Horizontal . . . . . 66°
- Vertical . . . . . 50°

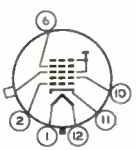
Electron Gun . . . . . Ion-Trap Type Requiring External Single-Field Magnet

Tube Dimensions:
- Maximum overall length . . . . . 19-5/16"
- Greatest width at lip . . . . . 15-15/16" ± 1/8"
- Greatest height at lip . . . . . 12-1/4" ± 1/8"
- Diagonal at lip . . . . . 16-13/16" ± 3/16"
- Neck length . . . . . 7-1/2" ± 3/16"
- Radius of curvature of faceplate (External surface) . . 30"

Screen Dimensions (Minimum): ←
- Greatest width . . . . . 14-3/8"
- Greatest height . . . . . 10-11/16"
- Diagonal . . . . . 15-1/4"

Operating Position . . . . . Any
Ultor Terminal . . . . . Metal-Shell Lip
Base . . Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-63) ←
- Basing Designation for BOTTOM VIEW . . . . . 12M ←

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



Metal-Shell Lip – Ultor (Grid No.3, Grid No.5, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		←
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

← Indicates a change.

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17TP4

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

SHORT RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **114° 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
	850 min.	pf
Heater Current at 2.68 volts	450 ± 45	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

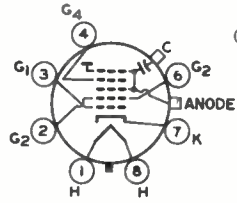
Optical:

Phosphor (For Cu-ves, see front of this Section). P4—Sulfide Type, Aluminized
Faceplate . . . . . Filterglass
Light transmission (Approx.). 77%

Mechanical:

Weight (Approx.). . . . . 14 lbs
Overall Length. . . . . 10-15/16" ± 3/16"
Neck Length . . . . . 3-11/16" ± 1/16"
Projected Area of Screen. . . . . 172 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 J149 A* sheets at front of this section
Cap . . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-20B)
Basing Designation for BOTTOM VIEW. 8JK

Pin 1 – Heater
Pin 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



Cap – Anode (Grid No.3, Grid No.5, Screen, Collector)
C – External Conductive Coating

19ABP4

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	950 max.	volts
Negative value	700 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
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	2.9 max. 2.4 min.	volts 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	16000	volts
Grid-No.4 Voltage	100 to 500	volts
Grid-No.2 Voltage	300	volts
Grid-No.1 Voltage for visual extinction of focused raster	-35 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

19AFP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **114° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 5%	ma
Heater Warm-Up Time (Average)	11	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	1500 max. / 1000 min.	μμf

Electron Gun . . . . . .Type Requiring No Ion-Trap Magnet

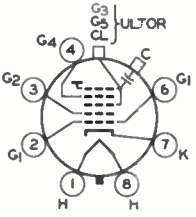
Optical:

Faceplate and Protective Panel . . . . . .Filterglass
Light transmission (Approx.) 44%
Phosphor (For curves, see front of this Section) .P4—Sulfice Type, Aluminized

Mechanical:

Operating Position . . . . . .Any
Weight (Approx.) . . . . . 18-1/2 lbs
Overall Length . . . . . 11-5/8" ± 5/16"
Neck Length. . . . . 4-1/8" ± 1/8"
Projected Area of Screen . . . . . 172 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 J149 C* 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)
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



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 peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 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 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with 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 400	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

19AHP4

Picture Tube

SHORT RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **114° 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	6	pf
External conductive coating to anode	1500 max. 1000 min.	pf
Heater Current at 6.3 volts	450 ± 25	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

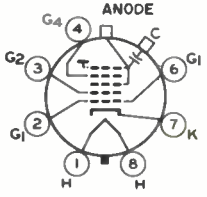
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate	Filterglass
Light transmission (Approx.)	78%

Mechanical:

Weight (Approx.)	13-1/2 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:	
Type	Regular-Band
Contact area for grounding	Near Reference Line

For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J149A* sheets 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



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

19AHP4

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

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

ANODE VOLTAGE	17600 max. 12000 min.	volts volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	650 max.	volts
CATHODE VOLTAGE:		
Negative peak value	2 max.	volts
Negative bias value	0 max.	volts
Positive bias value	154 max.	volts
Positive peak value	220 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts 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 Cathode-Drive Service:

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

Anode Voltage	14000	volts
Grid-No.4 Voltage	0 to 400	volts
Grid-No.2 Voltage	500	volts
Cathode Voltage for visual extinction of focused raster	40 to 63	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

19AJP4

Picture Tube

SHORT RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **114° MAGNETIC DEFLECTION**
LOW GRID-No.2 VOLTAGE — **CATHODE-DRIVE TYPE**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	450 ± 10%	ma
Heater Warm-Up Time (Average)	11	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	1900 max. 1400 min.	μμf μμf

Electron Gun . . . . . Type Requiring No Ion-Trap Magnet

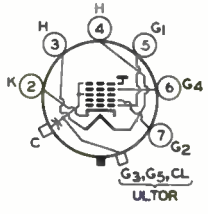
Optical:

Faceplate . . . . . Filterglass
Light transmission (Approx.) 78%
Phosphor (For curves, see front of this Section) . . P4—Sulfide Type, Aluminized

Mechanical:

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:
Type . . . . . Regular Band
Contact area for grounding . . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines* and *Bulb J149 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 BOTTOM VIEW 7FA

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	19800 max. 12000 min.	volts volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	70 max. 40 min.	volts volts
CATHODE-TO-GRID-No.1 VOLTAGE	100 max.	volts
HEATER VOLTAGE	7 max. 5.8 min.	volts 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	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Typical Operating Conditions:

With ultor-to-grid-No.1 voltage of	*14500*	*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 500	volts
Cathode-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

19AUP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
114° 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	6	pf
External conductive coating to anode	1500 max. / 1000 min.	pf
Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For Curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate and Protective Panel	Filterglass
Light transmission (Approx.)	44%
Surface of Protective Panel	Treated to reduce specular reflection

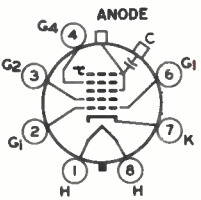
Mechanical:

Weight (Approx.)	18-1/2 lbs
Overall Length	11-5/8" ± 5/16"
Neck Length	4-1/8" ± 1/8"
Projected Area of Screen	174 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 J149 C* sheets 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

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

19AUP4

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	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts 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	16000	volts
Grid-No.4 Voltage	0 to 400	volts
Grid-No.2 Voltage	300	volts
Grid-No.1 Voltage for visual extinction of focused raster	-35 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

19AVP4

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **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)	11	seconds
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	114°	
Horizontal	102°	
Vertical	85°	
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	1500 max. / 1000 min.	μμf
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Faceplate	Filterglass
Light transmission at center (Approx.)	78%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Medium Short

Mechanical:

Tube Dimensions:	
Overall length	11-3/8" ± 1/4"
Greatest width	16-13/32" ± 1/8"
Greatest height	13-11/32" ± 1/8"
Diagonal	18-5/8" ± 1/8"
Neck length	4-1/8" ± 1/8"
Curvature of faceplate (External Radii):	
Center	48"
Edge	21"
Screen Dimensions (Minimum):	
Greatest width	15-1/8"
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)
Bulb	J149A1

19AVP4

Base. . . . . Small-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

Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

GRID-DRIVE[A] SERVICE

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

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

ULTOR VOLTAGE	23000 max. 15000 min.	volts volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max. 200 min.	volts volts
GRID-No.1 VOLTAGE:		
Negative-peak value	220 max.	volts
Negative-bias value	154 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor voltage (E_{c_3k}) of	*20000*	*volts*
and grid-No.2 voltage (E_{c_2k}) of	*400*	*volts*
Grid-No.4 Voltage for focus●	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster★	-36 to -94	volts
Field Strength of Adjustable Centering Magnet◆	0 to 9	gausses

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-Maximum Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	23000 max. 15000 min.	volts volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	1250 max.	volts
Negative value	400 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	700 max. 350 min.	volts volts
GRID-No.2-TO-CATHODE VOLTAGE	550 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	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) of	*20000*	*volts*
and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) of	*400*	*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▲	36 to 78	volts
Field Strength of Adjustable Centering Magnet♦	0 to 9	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.4 (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 2-1/8". 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:

$$\sqrt{\frac{Ec_5{}^k \text{ or } Ec_{5g_1} \text{ (volts)}}{16000 \text{ (volts)}}} \times 8 \text{ gausses}$$

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.

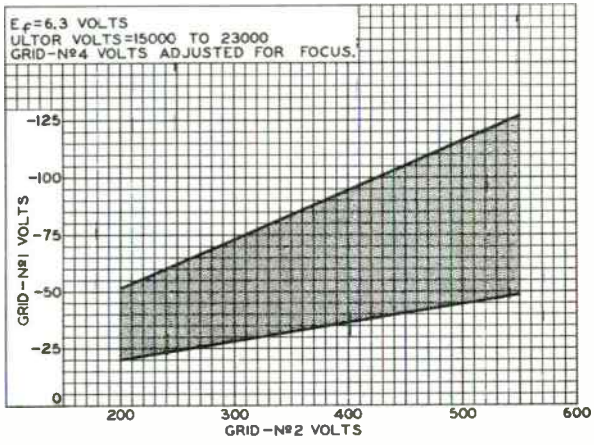
♠ See *Raster-Cutoff-Range Chart for Cathode-Drive Service.*

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 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



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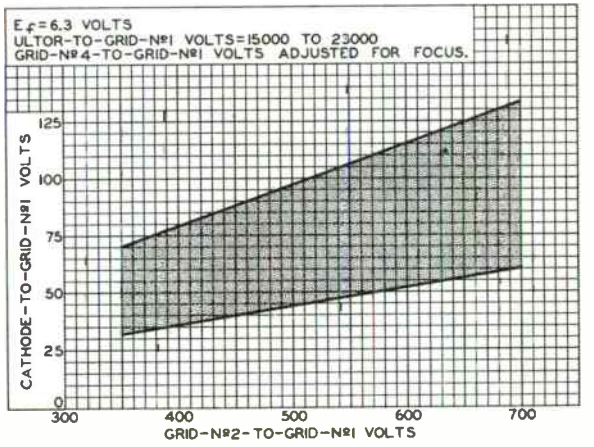
Cathode-Drive Service



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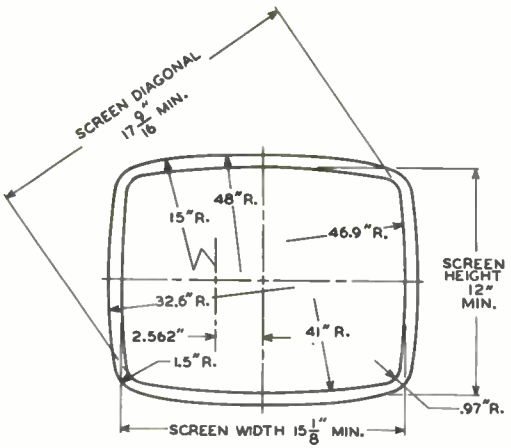
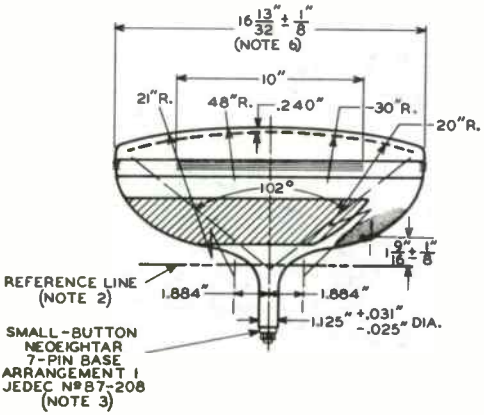
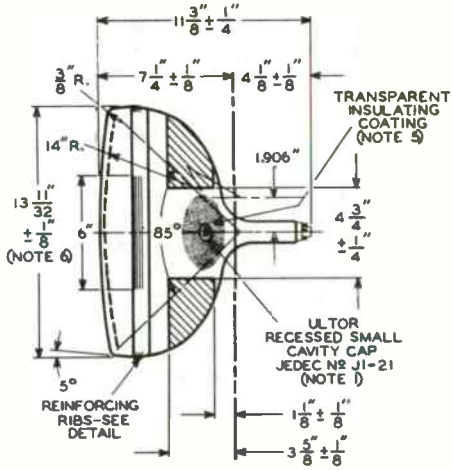
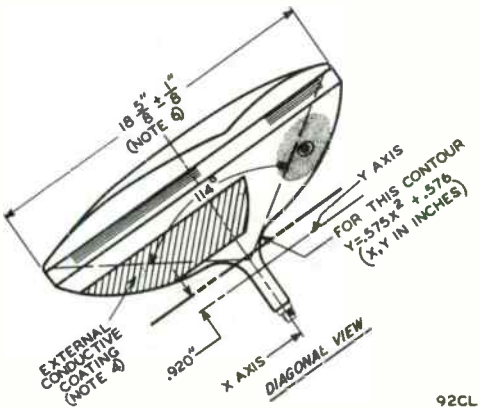
19AVP4









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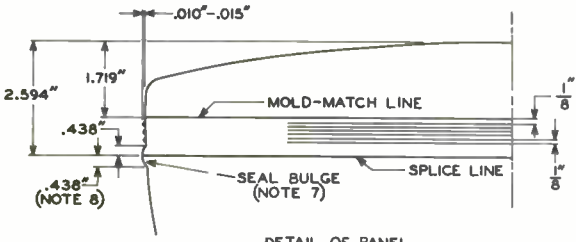
19AVP4



DETAIL OF PANEL

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 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.

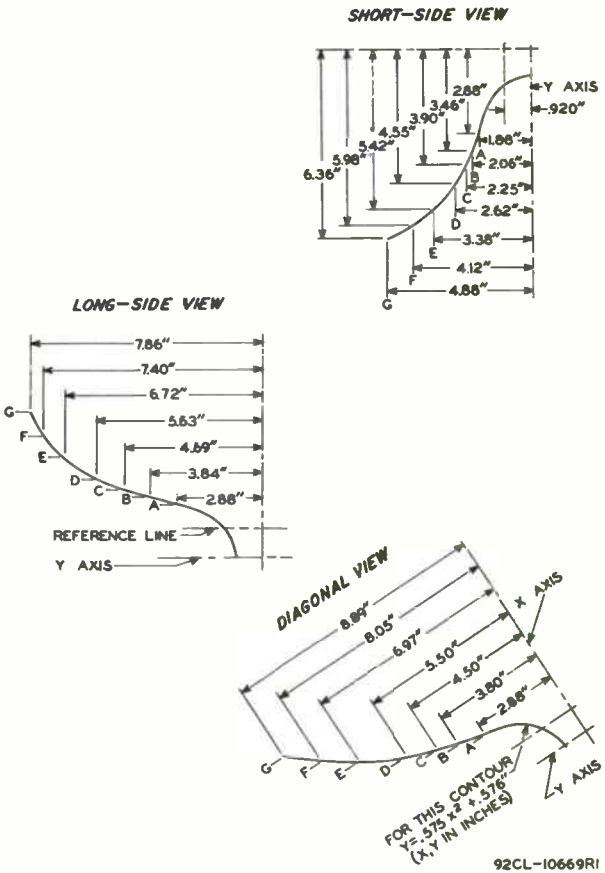
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

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



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.

19AYP4

Picture Tube

SHORT RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 114° 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

19BDP4

Picture Tube

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

Electrical:

Heater Current at 6.3 volts	600 ± 10%	ma
Heater Warm-Up Time (Average)	11	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	2000 max. 1500 min.	μμf μμf

Electron Gun . . . . . Type Requiring No Ion-Trap Magnet

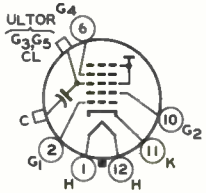
Optical:

Faceplate . . . . . Filterglass
Light transmission (Approx.) 78%
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 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 J149 B* 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.B6-203)
Small-Shell Duodecal 6-Pin, Arrangement 1 (JEDEC Group 4, No.B6-63)
Basing 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



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

19BDP4

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

ULTOR-TO-GRID-No.1 VOLTAGE	19800 max. 12000 min.	volts volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	70 max. 40 min.	volts volts
CATHODE-TO-GRID-No.1 VOLTAGE	100 max.	volts
HEATER VOLTAGE	7 max. 5.8 min.	volts 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	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Typical Operating Conditions:

With ultor-to-grid-No.1 voltage of	*14500*	*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 500	volts
Cathode-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

Picture Tube

SHORT RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 114° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

The 19BTP4 is the same as the 19YP4 except for the following item:

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

ULTOR VOLTAGE	23000 max.	volts
	11000 min.	volts

19CHP4

Picture Tube

SHORT RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS
LOW GRID-No.2 VOLTAGE

ALUMINIZED SCREEN
114° MAGNETIC DEFLECTION
CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	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	1500 max. / 1000 min.	μμf

Electron Gun . . . . . Type Requiring No Ion-Trap Magnet

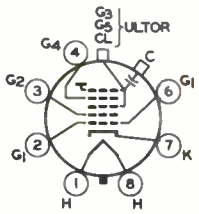
Optical:

Faceplate . . . . . Filterglass
Light transmission (Approx.) 78%
Phosphor (For curves, see front of this section) . P4—Sulfide Type, Aluminized

Mechanical:

Operating Position . . . . . Any
Weight (Approx.) . . . . . 14 lbs
Overall Length . . . . . 11-5/8" ± 1/4"
Neck Length . . . . . 4-3/8" ± 1/8"
Projected Area of Screen . . . . . 172 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 J149 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)
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



Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

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

ULTOR-TO-GRID-No.1 VOLTAGE	20000 max. 10000 min.	volts volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	1250 max.	volts
Negative value	400 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	70 max. 40 min.	volts volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive peak value	150 max.	volts
Positive bias value	100 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor-to-grid-No.1 voltage of	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*50*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	-50 to +250	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	32 to 50	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

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 — **114° MAGNETIC DEFLECTION**
NO ION-TRAP MAGNET REQUIRED

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.	1500 max. 1000 min.	pf pf
Heater Current at 6.3 volts	450 ± 20	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate	Filterglass
Light Transmission (Approx.)	48% ←

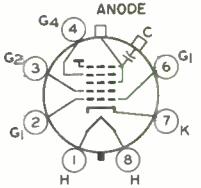
Mechanical:

Weight (Approx.)	15 lbs
Overall Length	11.375" ± .250"
Neck Length	4.125" ± .125"
Projected Area of Screen	172 sq. in.
External Conductive Coating[a]:	
Type	Regular-Band
Contact area for grounding	Near Reference Line

For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines* and *Bulb J149F* sheets ← 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

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



← Indicates a change.

19DQP4

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

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

Anode Voltage	23000 max.	volts
	11000 min.	volts
Grid-No.4 (Focusing) Voltage:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
Grid-No.2 Voltage	550 max.	volts
	200 min.	volts
Grid-No.1 Voltage:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
Heater Voltage	6.9 max.	volts
	5.7 min.	volts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	300 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 Cathode-Drive Service:

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

Anode Voltage	16000	volts
Grid-No.4 Voltage[b]	200	volts
Grid-No.2 Voltage	300	volts
Cathode Voltage for visual extinction of focused raster	28 to 62	volts
Field Strength of required adjustable centering magnet[c]	0 to 8	gauss

Maximum Circuit Value:

Grid-No.1 Circuit Resistance	1.5 max.	megohms

[a] External conductive coating and implosion protection hardware must be grounded.

→ [b] 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 100 microamperes on a 10-1/2-inch by 14-inch pattern from an RCA-2F21 monoscope, or equivalent.

→ Indicates a change.

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Electronic Components and Devices Harrison, N. J.

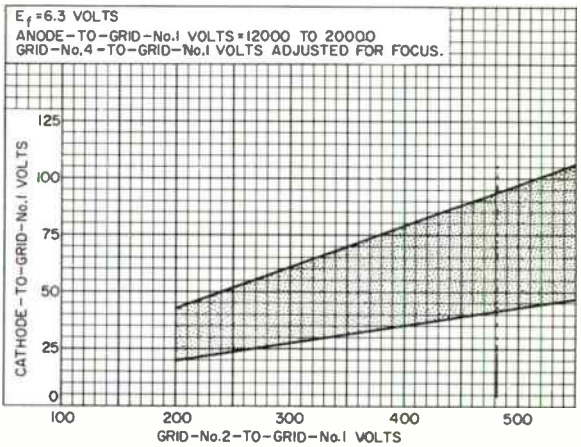
[c] Distance from Reference Line for suitable PM centering magnet should not exceed 2-1/4 inches. The specified centering magnet compensates only for the effect which mechanical tube tolerances may have on the location of the undeflected, focused spot with respect to the center of the tube face. Maximum field strength of adjustable centering magnet equals

$$N\sqrt{\frac{\text{Anode volts}}{16000 \text{ volts}}} \times 8 \text{ gauss}$$

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.

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

RASTER-CUTOFF-RANGE CHART
Cathode-Drive Service



92CS-12008

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
LOW-VOLTAGE ELECTROSTATIC FOCUS
HEATER CONTROLLED WARM-UP TIME
NO ION-TRAP MAGNET REQUIRED
114° MAGNETIC DEFLECTION
ALUMINIZED SCREEN

The 19DRP4 is the same as the 19DQP4 except for the following item:

Electrical:

Heater current at 6.3 volts	600 ± 30	ma

19ENP4A

Picture Tube

PAN-O-PLY—INTEGRAL IMPLOSION PROTECTION
LOW-VOLTAGE ELECTROSTATIC FOCUS — 114° MAGNETIC DEFLECTION
LOW-GRID-No.2 VOLTAGE — CATHODE-DRIVE TYPE

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[a]	1500 max 1000 min	pF pF
Heater Current at 6.3 V	450 ± 20	mA
Heater Warm-Up Time (Average)	11	s
Electron Gun	Type Requiring No Ion-Trap Magnet	

OPTICAL

Phosphor	P4—Sulfide Type, Aluminized
For curves, see front of this section	
Faceplate	Filterglass
Light transmission at center (approx.)	48%

MECHANICAL

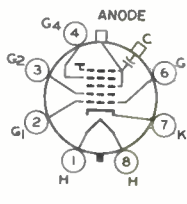
Weight (Approx.)	15 lb
Overall Length	11.625 ± 0.250 in
Neck Length	4.375 ± 0.125 in
Projected Area of Screen	172 sq in
External Conductive Coating	
Type	Modified-Band
Contact area for grounding	Near Reference Line

For Additional Information on Coatings and Dimensions
See *Picture-Tube Dimensional-Outlines and Bulb J149 F* sheets 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)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Heater
Pin 2 – Grid No.2
Pin 3 – Grid No.3
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



8HR

MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES

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

Anode Voltage	21000 max 12000 min	V V
Grid-No.4 (Focusing) Voltage		
Positive value	1250 max	V
Negative value	400 max	V
Grid-No.2 Voltage	60 max 25 min	V 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 5.7 min	V 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 and DC voltage	200 max	V
DC component	100 max	V

TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE

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

Anode Voltage	16000	V
Grid-No.4 Voltage	250	V
Grid-No.2 Voltage	50	V
Cathode Voltage	32 to 50	V
For visual extinction of focused raster		

MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance	1.5 max	MΩ

[a] External conductive coating and implosion protection hardware must be grounded.

[b] The grid-No.4 voltage required for optimum focus of any individual tube will have a value anywhere between 0 to + 400 volts with the combined grid-No.1 voltage and video-signal voltage adjusted to give an anode current of 100 microamperes on a 10-1/2 inch by 14-inch pattern from an RCA-2F21 monoscope, or equivalent.

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

Picture Tube

PAN-O-PLY—INTEGRAL IMPLOSION PROTECTION
LOW-VOLTAGE ELECTROSTATIC FOCUS 114° MAGNETIC DEFLECTION

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[a]	1750 max 1250 min	pF pF
Heater Current at 6.3 V	450 ±20	mA
Heater Warm-Up Time (Average)	11	s
Electron Gun	Type Requiring No Ion-Trap Magnet	

OPTICAL

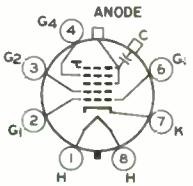
Phosphor	P4—Sulfide Type, Aluminized
For curves, see front of this section	
Faceplate	Filterglass
Light transmission at center (approx.)	48%

MECHANICAL

Weight (Approx.)	15 lb
Overall Length	11.625 ± 0.250 in
Neck Length	4.375 ± 0.125 in
Projected Area of Screen	172 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 J149F* sheets 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)

TERMINAL DIAGRAM (Bottom View)

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



8HR

MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES

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

Anode Voltage	18000 max 10000 min	V V
Grid-No.4 (Focusing) Voltage		
Positive value	1100 max	V
Negative value	550 max	V
Grid-No.2 Voltage	550 max 200 min	V V
Grid-No.1 Voltage		
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	6.9 max 5.7 min	V 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 and DC voltage	200 max	V
DC component	100 max	V

TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE

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

Anode Voltage	16000	V
Grid-No.4 Voltage[b]	200	V
Grid-No.2 Voltage	400	V
Cathode Voltage	40 to 76	V
For visual extinction of focused raster		

MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance	1.5 max	MΩ

[a] External conductive coating and implosion protection hardware must be grounded.

[b] 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 100 microamperes on a 10-1/2-inch by 14-inch pattern from an RCA-2F21 monoscope, or equivalent.

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

Picture Tube

PAN-O-PLY—INTEGRAL IMPLOSION PROTECTION
LOW-VOLTAGE ELECTROSTATIC FOCUS 114° MAGNETIC DEFLECTION

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[a].	1250 min—1750 max	pF
Heater Current at 6.3 V.	450 ± 20	mA
Heater Warm-up Time (Average).	11	s
Electron Gun . . . . . .Type Requiring No Ion-Trap Magnet		

OPTICAL

Phosphor . . . . . P4—Sulfide Type, Aluminized
For curves, see front of this section
Faceplate. . . . . . .Filterglass
Light transmission at center (approx.) 48%

MECHANICAL

Weight (Approx.)	15 lb
Overall Length	11.625 ± 0.250 in
Neck Length.	4.375 ± 0.125 in
Projected Area of Screen	172 sq in
External Conductive Coating	
Type (See CRT OUTLINES 1 at front of this section) . . .	Regular-Band
Contact area for grounding	.Near Reference Line
Cap.	Recessed Small Cavity (JEDEC No.J1-21)
Base	Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)

TERMINAL DIAGRAM (Bottom View)

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

8HR

MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES

Voltages are positive with respect to cathode

Anode Voltage.	11000 min—23000 max	V
Grid-No.4 (Focusing) Voltage		
Positive value	1100 max	V
Negative value	550 max	V
Grid-No.2 Voltage.	200 min—550 max	V
Grid-No.1 Voltage		
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	5.7 min—6.9 max	V
Peak Heater-Cathode Voltage		
Heater negative with respect to cathode:		
During equipment warm-up period ≤ 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

Voltages are positive with respect to grid No.1

Anode Voltage	16000	V
Grid-No.4 Voltage[b]	200	V
Grid-No.2 Voltage	300	V
Cathode Voltage	28 to 62	V

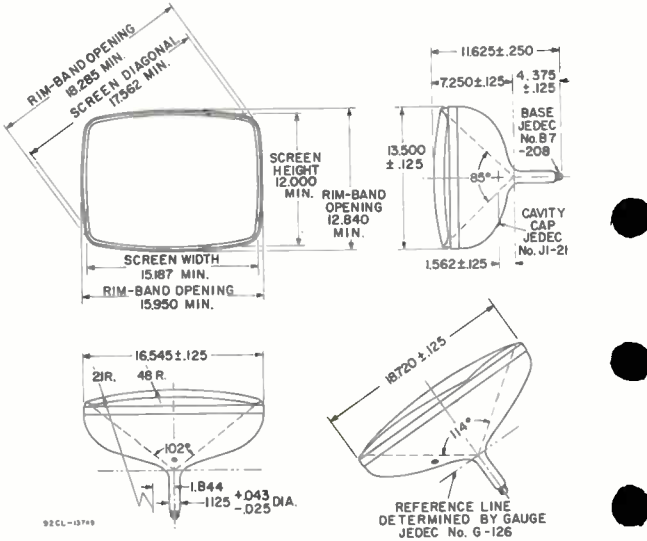
MAXIMUM CIRCUIT VALUE

Grid-No.1 Circuit Resistance	1.5 max	MΩ

[a] External conductive coating and implosion protection hardware must be grounded.

[b] 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 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

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19XP4

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **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)	11	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	1500 max.	μμf
	1000 min.	μμf
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	114°	
Horizontal	102°	
Vertical	85°	
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Faceplate	Filterglass
Light transmission at center (Approx.)	78%
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Medium Short

Mechanical:

Tube Dimensions:

Overall length	11-3/8" ± 1/4"
Greatest width	16-13/32" ± 1/8"
Greatest height	13-11/32" ± 1/8"
Diagonal	18-5/8" ± 1/8"
Neck length	4-1/8" ± 1/8"

Radius of curvature of faceplate:

	Radius at center	*Radius at edge*
External surface	48"	21"
Internal surface:		
In plane of diagonal deflection	30"	20"
In plane of horizontal deflection	30"	20"
In plane of vertical deflection	30"	14"

Screen Dimensions (Minimum):

Greatest width	15-1/8"
Greatest height	12"
Diagonal	17-9/16"
Projected area	172 sq. in.

19XP4

Weight (Approx.)	14 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JEDEC No. J1-21)
Bulb	J149A1
Base	Small-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

Cap – Ultor (Grid 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:*

ULTOR VOLTAGE	20000 max.	volts
	11000 min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
	200 min.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	220 max.	volts
Negative-bias value	154 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
HEATER VOLTAGE	6.9 max.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c_3k}) between 11000 and 20000 volts and grid-No.2 voltage (E_{c_2k}) between 220 and 550 volts

Grid-No.4 Voltage for focus●	0 to 400	volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	

Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet[A]	0 to 8	gauss

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*volts*
and grid-No.2 voltage of	*400*	*volts*
Grid-No.4 Voltage for focus[B]	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster	−36 to −94	volts
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	36 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-Maximum Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	20000 max. 11000 min.	volts volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	1250 max.	volts
Negative value	400 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	700 max. 350 min.	volts volts
GRID-No.2-TO-CATHODE VOLTAGE	550 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	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g1}) between 11000 and 20000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 225 and 700 volts

Grid-No.4-to-Grid-No.1 Voltage for focus●	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (Ek_{g1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gauss

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	*400*	*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	36 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	−36 to −78	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.

● Individual tubes will have satisfactory focus at some value of grid-No.4 (or grid-No.4-to-grid-No.1) voltage between 0 and 400 volts with the combined bias voltage and video-signal voltage adjusted to produce an ultor current of 100 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 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 3/16-inch deflection of the spot from the center of the tube face.

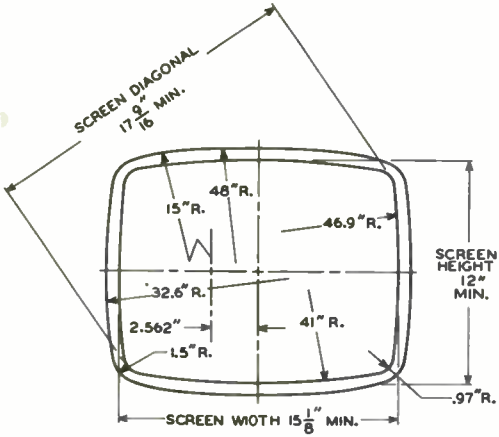
♦ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

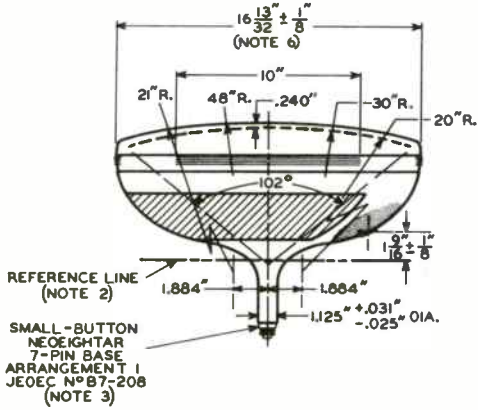
OPERATING CONSIDERATIONS

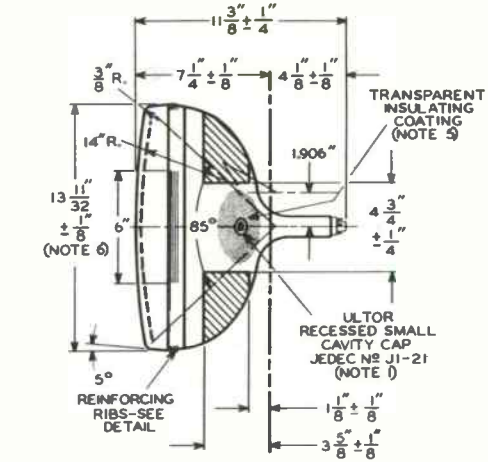
X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, this picture tube does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 20 kilovolts (Design-maximum value), shielding of this picture tube for X-ray radiation 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.

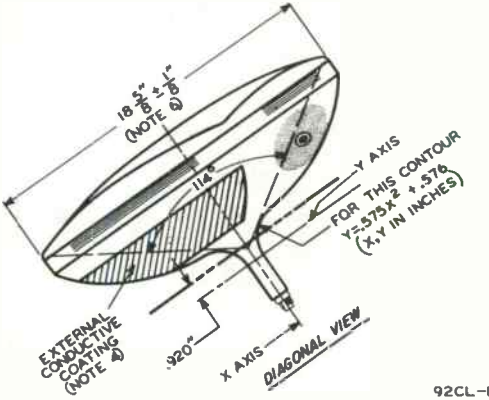
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of this picture tube to protect it from being struck accidentally and to protect against possible damage resulting from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

19XP4









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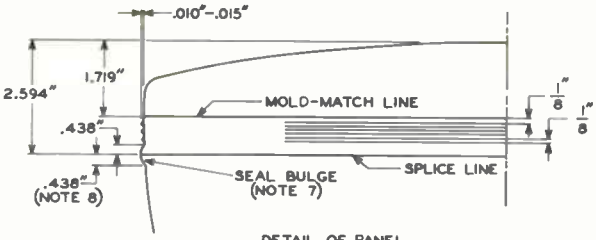
19XP4



DETAIL OF PANEL

NOTE 1: THE PLANE THRDUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THRDUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABDUT THE TUBE AXIS) OF ± 3D°. ULTDR TERMINAL IS DN 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 DF THE PLANE CC' DF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FDR THIS BASE SHOULD NOT BE RIGIDLY MDUNTED; IT SHDULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN DF 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.

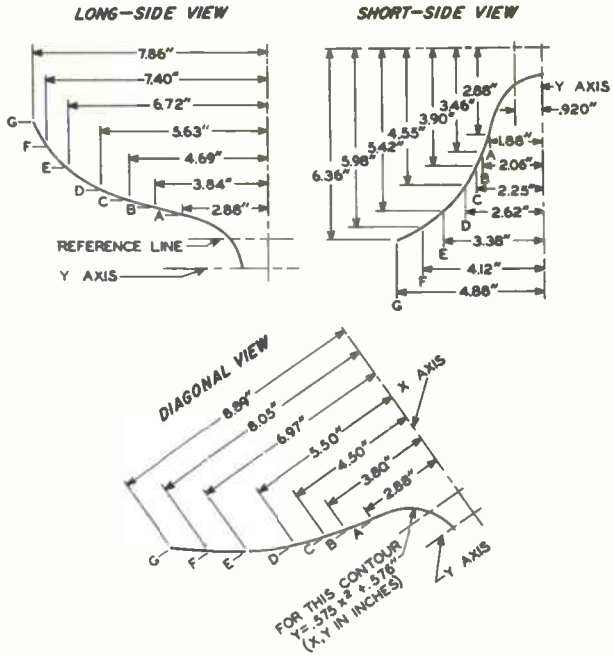
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: MEASURED 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.

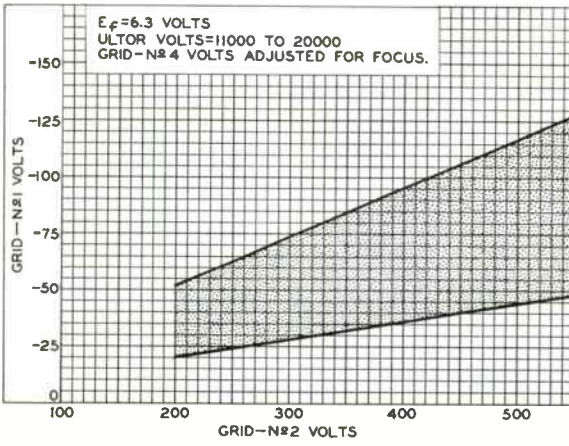
NOTE 8: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/8" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF THE TUBE SUPPORT BAND. TUBE MOUNTING AND YOKE SUPPORT CLAMPS MUST BE SPACED FROM THE TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

BULB-CONTOUR DIMENSIONS



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.

RASTER-CUTOFF-RANGE CHARTS
Grid-Drive Service



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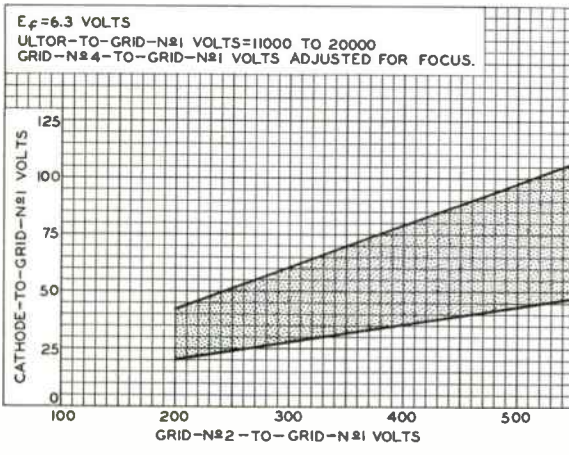
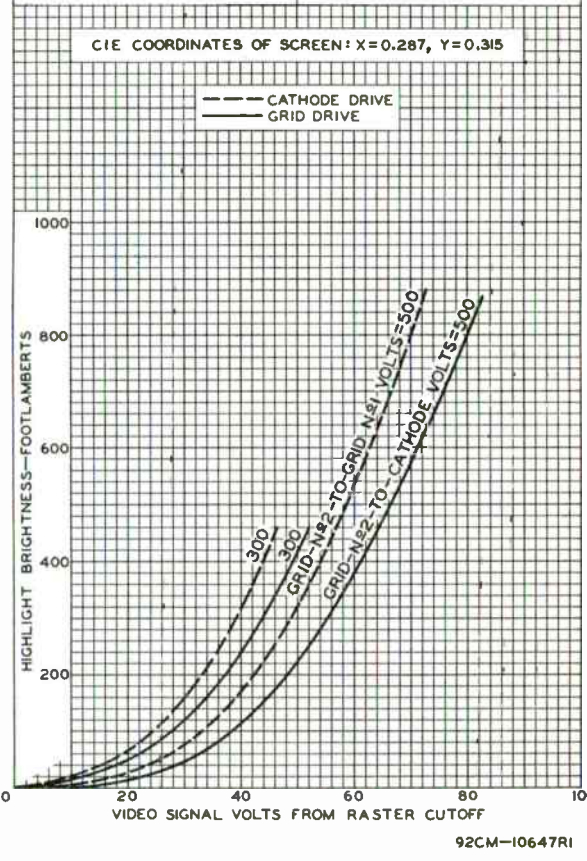
Cathode-Drive Service



92CS-10641

AVERAGE DRIVE CHARACTERISTICS

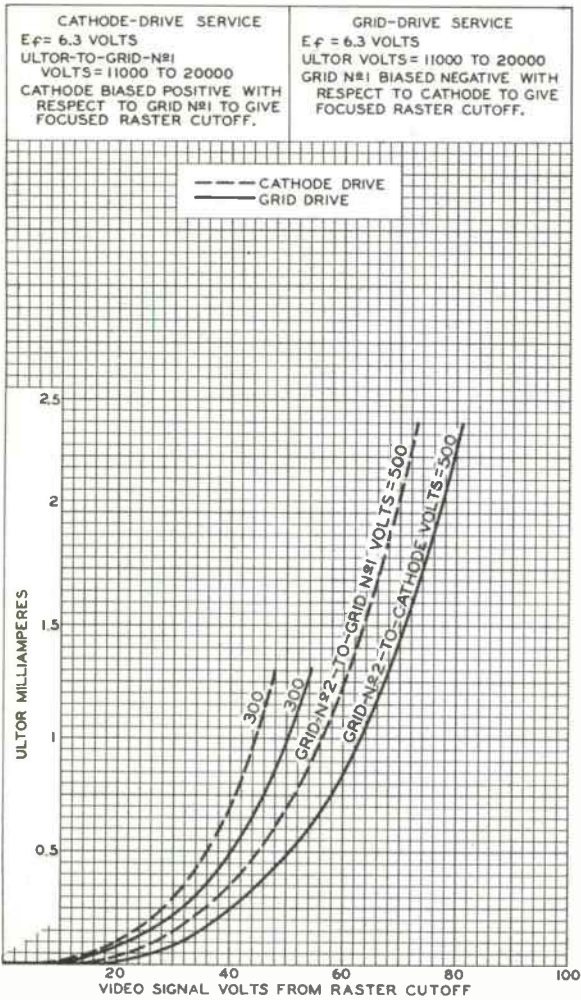
CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 14" x 10½"	RASTER SIZE = 14" x 10½"



92CM—10647RI

19XP4

AVERAGE DRIVE CHARACTERISTICS



92CM-10643

Picture Tube

SHORT RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **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)	11	seconds
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	114°	
Horizontal	102°	
Vertical	85°	
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	1500 max. 1000 min.	μμf μμf
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Faceplate	Filterglass
Light transmission at center (Approx.)	78%
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Medium Short

Mechanical:

Tube Dimensions:	
Overall length	10-13/16" ± 1/4"
Greatest width	16-13/32" ± 1/8"
Greatest height	13-11/32" ± 1/8"
Diagonal	18-5/8" ± 1/8"
Neck length	3-9/16" ± 1/8"
Curvature of faceplate (External Radii):	
Center	48"
Edge	21"
Screen Dimensions (Minimum):	
Greatest width	15-1/8"
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)
Bulb	J149A1

19YP4

Base. . . . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No. B7-208)

Basing Designation for BOTTOM VIEW. 8JR

Pin 1 – Heater
Pin 2 – Grid-No.1
Pin 3 – Grid No.2
Pin 4 – Grid No.3
Pin 6 – Internal Connection—Do Not Use
Pin 7 – Cathode

Pin 8 – Heater
Cap – Ultor (Grid No.4, 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:*

ULTOR VOLTAGE	20000 max. 11000 min.	volts volts
GRID-No.3 (FOCUSING) VOLTAGE:		
Positive value	700 max.	volts
Negative value	350 max.	volts
GRID-No.2 VOLTAGE	600 max. 300 min.	volts volts
GRID-No.1 VOLTAGE:		
Negative-peak value	220 max.	volts
Negative-bias value	154 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor voltage (E_{c_4k}) of	*16000*	*volts*
and grid-No.2 voltage (E_{c_2k}) of	*500*	*volts*
Grid-No.3 Voltage for focus●	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster★	-43 to -78	volts
Field Strength of Adjustable Centering Magnet♦	0 to 10	gauss

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-Maximum Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	20000 max. 11000 min.	volts volts
GRID-No.3-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	850 max.	volts
Negative value	200 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	750 max. 450 min.	volts volts
GRID-No.2-TO-CATHODE VOLTAGE	600 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	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor-to-grid-No.1 voltage ($E_{c_1g_1}$) of	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) of	*500*	*volts*
Grid-No.3-to-Grid-No.1 Voltage for focus●	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster▲	41 to 69	volts
Field Strength of Adjustable 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 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 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.

★ See *Raster-Cutoff-Range Chart for Grid-Drive Service.*

♦ Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/8". 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:

$$\sqrt{\frac{E_{c_2k} \text{ or } E_{c_4g_1} \text{ (volts)}}{16000 \text{ (volts)}}} \times 10 \text{ gauss}$$

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.

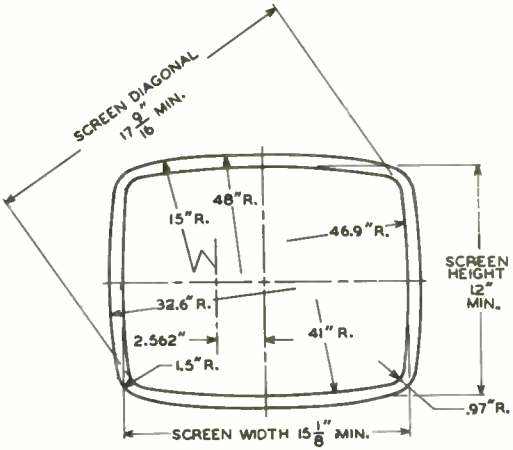
♦ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

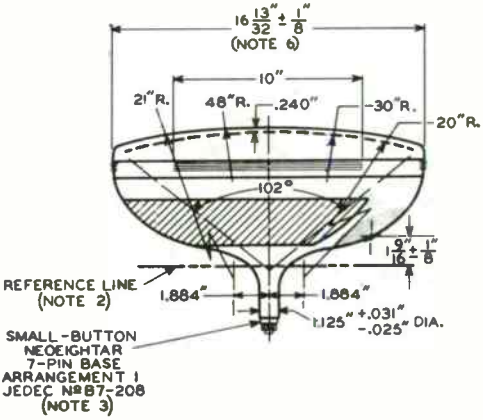
♠ See *Raster-Cutoff-Range Chart for Cathode-Drive Service.*

OPERATING CONSIDERATIONS

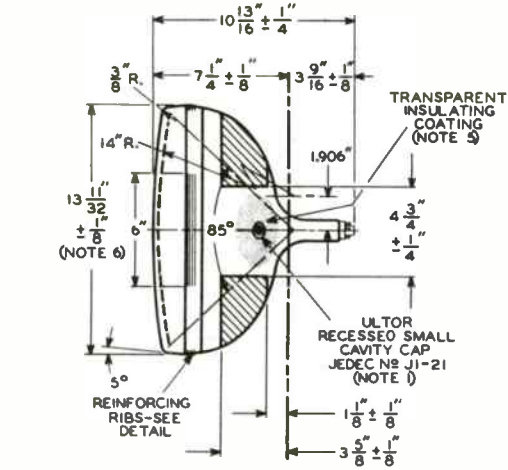
X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, this picture tube does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 20 kilovolts (Design-maximum value), shielding of this picture tube for X-ray radiation 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.

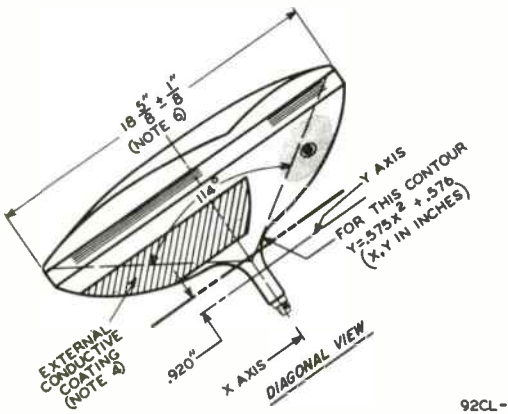
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatterproof, glass cover over the face of this picture tube to protect it from being struck accidentally and to protect against possible damage resulting from tube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





19YP4





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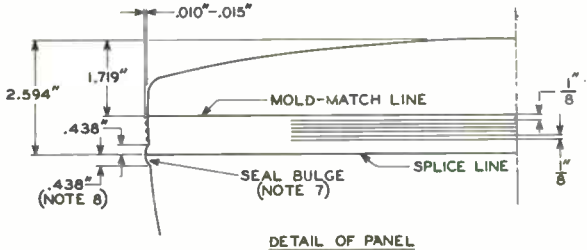


DETAIL OF PANEL

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 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.

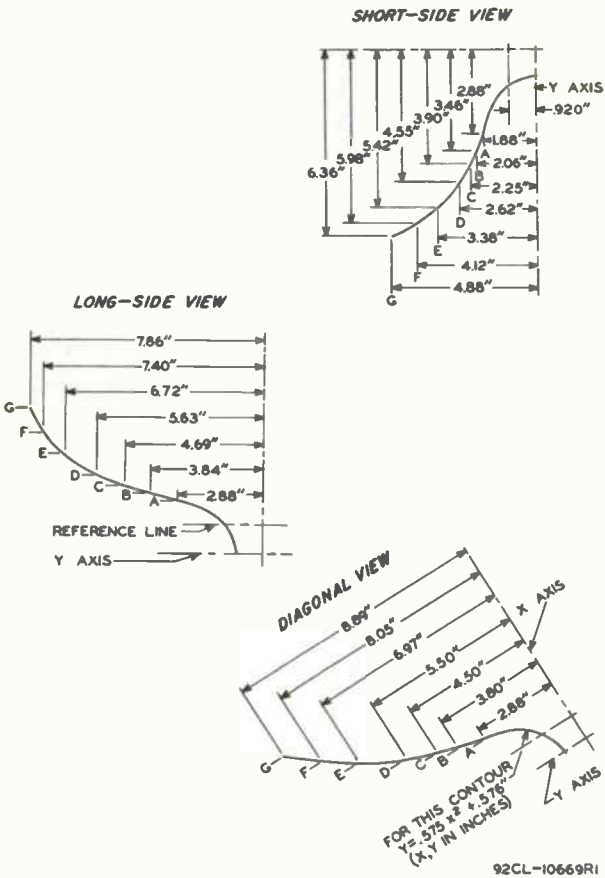
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

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.

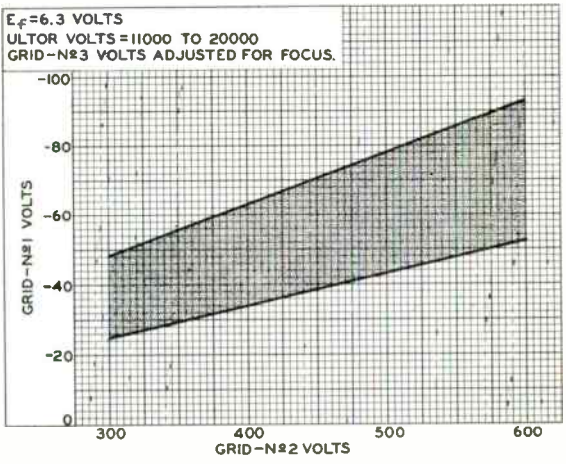
NOTE 8: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/8" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF THE TUBE SUPPORT BAND. TUBE MOUNTING AND YOKE SUPPORT CLAMPS MUST BE SPACED FROM THE TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

BULB-CONTOUR DIMENSIONS



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.

RASTER-CUTOFF-RANGE CHARTS
Grid-Drive Service



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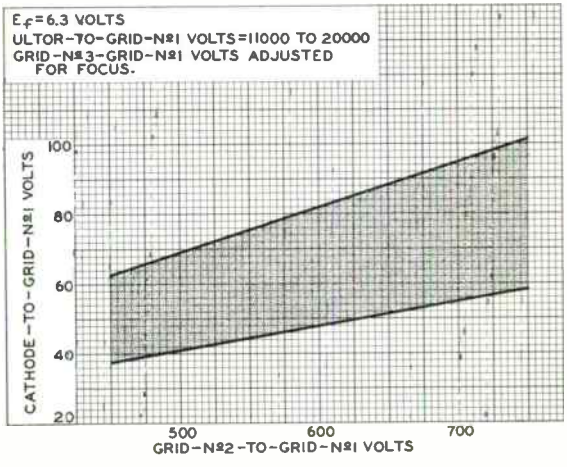
Cathode-Drive Service



92CS-10818

20DP4D

Picture Tube

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
70° MAGNETIC DEFLECTION

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	1500 max. / 500 min.	pf
Heater Current at 6.3 volts	600 ± 30	ma
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

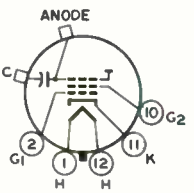
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	75%

Mechanical:

Weight (Approx.)	30 lbs
Overall Length	21-3/4" ± 3/8"
Neck Length	7-1/2" ± 3/16"
Projected Area of Screen	215 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 J161 C/D* sheets at front of this section

Cap . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base. . Small-Shell Duodecal 5-Pin (JEDEC Group 4, No.B5-57)
Basing Designation for BOTTOM VIEW. 12N



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	450 max.	volts
Grid-No.1 Voltage:		
Negative bias value	140 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts

20DP4D

Heater Voltage.	6.9 max. 5.7 min.	volts 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	16000	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

20HP4E

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
70° MAGNETIC DEFLECTION

Electrical:

Heater Current at 6.3 volts	600 ± 30	ma
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	pf
Cathode to all other electrodes	5	pf
External conductive coating to anode	1500 max. 500 min.	pf pf
Electron Gun	Type Requiring No Ion-Trap Magnet	

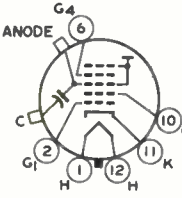
Optical:

Phosphor (For Curves, see front of this Section). P4—Sulfide Type, Aluminized
Faceplate, Spherical. . . . . Filterglass
Light transmission (Approx.). 75%

Mechanical:

Weight (Approx.). . . . . 30 lbs
Overall Length. . . . . 21-3/4" ± 3/8"
Neck Length . . . . . 7-1/2" ± 3/16"
Projected Area of Screen. . . . . 215 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 J161 C/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)
Basing 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 – Catnode
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	17500 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts

20HP4E

GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	140 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts 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	14000	volts
Grid-No.4 Voltage	-56 to +310	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

21AMP4B

Picture Tube

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
90° MAGNETIC DEFLECTION

Electrical:

Heater Current at 6.3 volts	600	ma
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. / 2000 min.	pf
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

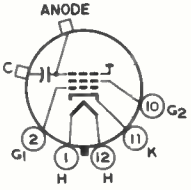
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	74%
Phosphor (For Curves, see front of this Section)	P4-Sulfide Type, Aluminized

Mechanical:

Operating Position	Any
Weight (Approx.)	24 lbs
Overall Length	20" ± 3/8"
Neck Length	7-1/2" ± 3/16"
Projected Area of Screen	262 sq. in.
External Conductive Coating:	
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 J171 D/E* sheets at the front of this section

Cap. . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . Small-Shell Duodecal 5-Pin (JEDEC Group 4, No.B5-57)
Basing Designation for BOTTOM VIEW 12N



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

Cap-Anode (Grid No.3, 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:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 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 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	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 raster	-28 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

20DP4-A/20CP4-A, 20DP4-C/20CP4-D

PICTURE TUBES

RECTANGULAR GLASS TYPES

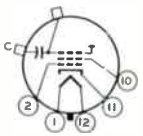
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Capacitance between External Conductive Coating and Ultor	1500 max. 500 min.	μμf μμf
Faceplate, Spherical	Filterglass	
Phosphor (For Curves, see front of this Section)	*Type 20DP4-A* P4—Sulfide Type	*Type 20DP4-C* P4—Sulfide Type Aluminized
Deflection Angles (Approx.):		
Diagonal	70°	
Horizontal	66°	
Vertical	50°	
Electron Gun	Ion-Trap Type Requiring External Single-Field Magnet	
Tube Dimensions:		
Overall length	21-9/16" ± 5/16"	
Greatest width	18-11/16" ± 1/8"	
Greatest height	14-15/16" ± 1/8"	
Diagonal	20-3/32" ± 1/8"	
Neck length	7-5/16" ± 1/8"	
Radius of curvature of faceplate (External surface)	40"	
Screen Dimensions (Minimum):		
Greatest width	17"	
Greatest height	12-3/4"	
Diagonal	18-3/8"	
Projected area	199 sq. in.	
Operating Position	Any	
Cap	Recessed Small Cavity (JETEC No.J1-21)	
Base . . Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57)		
Basing Designation for BOTTOM VIEW	12N	

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



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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts

← Indicates a change.

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

20DP4-A/20CP4-A, 20DP4-C/20CP4-D

PICTURE TUBES

GRID-No.1 VOLTAGE:		
Negative-bias value.	125 max.	volts
Positive-bias value.	0 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 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

20HP4-A/20MP4, 20HP4-D
PICTURE TUBES

RECTANGULAR GLASS TYPES

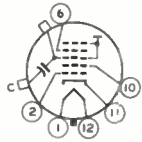
LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Capacitance between External Conductive Coating and Ultor	1500 max. 500 min.	μμf μμf ←
Faceplate, Spherical		Filterglass
Phosphor (For Curves, see front of this Section)	*Type 20HP4-A* P4—Sulfide Type	*Type 20HP4-D* P4—Sulfide Type Aluminized
Deflection Angles (Approx.):		
Diagonal		70°
Horizontal		66°
Vertical		50°
Electron Gun		Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:		
Overall length		21-3/4" ± 3/8"
Greatest width		18-11/16" ± 1/8"
Greatest height		14-15/16" ± 1/8"
Diagonal		20-3/32" ± 1/8"
Neck length		7-1/2' ± 3/16"
Radius of curvature of faceplate (External surface)		40"
Screen Dimensions (Minimum):		
Greatest width		17"
Greatest height		12-3/4"
Diagonal		18-3/8"
Projected area		199 sq. in.
Operating Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Base		Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-63) ←
Basing 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



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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max. volts
GRID-No.4 (FOCUSING) VOLTAGE:	
Positive value	1000 max. volts
Negative value	500 max. volts
GRID-No.2 VOLTAGE	500 max. volts

← Indicates a change.

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

20HP4-A/20MP4, 20HP4-D

PICTURE TUBES

GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 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 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

21ACP4-A/21BSP4/21AMP4-A

PICTURE TUBE

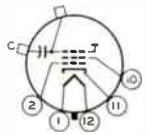
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp
Capacitance between External Conductive Coating and Ultor	2500 max. μμf; 2000 min. μμf
Faceplate, Spherical	Filterglass
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized
Deflection Angles (Approx.):	
Diagonal	90°
Horizontal	85°
Vertical	68°
Electron Gun	Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:	
Overall length	20" ± 3/8"
Greatest width	20-1/4" ± 1/8"
Greatest height	16-3/8" ± 1/8"
Diagonal	21-3/8" ± 1/8"
Neck length	7-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)	33"
Screen Dimensions (Minimum):	
Greatest width	19-1/16"
Greatest height	15-1/16"
Diagonal	20-1/4"
Projected area	262 sq. in.
Operating Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Base	Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57) ←
Basing Designation for BOTTOM VIEW	12N

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



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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	20000 max. volts
GRID-No.2 VOLTAGE	500 max. volts
GRID-No.1 VOLTAGE:	
Negative-peak value	200 max. volts
Negative-bias value	140 max. volts
Positive-bias value	0 max. volts
Positive-peak value	2 max. volts

← Indicates a change.

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

21ACP4-A/21BSP4/21AMP4-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

21ALP4-B/21ALP4-A

PICTURE TUBE

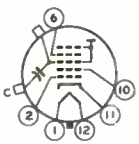
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current at 6.3 volts	0.6 ± 10%	volts
Capacitance between External Conductive Coating and Ultor	750 max. 500 min.	μμf μμf
Faceplate, Spherical	Filterglass	
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized	
Deflection Angles (Approx.):		
Diagonal	90°	
Horizontal	85°	
Vertical	68°	
Electron Gun	Ion-Trap Type Requiring External Single-Field Magnet	
Tube Dimensions:		
Overall length	20" ± 3/8"	
Greatest width	20-1/4" ± 1/8"	
Greatest height	16-3/8" ± 1/8"	
Diagonal	21-3/8" ± 1/8"	
Neck length	7-1/2" ± 3/16"	
Radius of curvature of faceplate (External surface)	33"	
Screen Dimensions (Minimum):		
Greatest width	19-1/16"	
Greatest height	15-1/16"	
Diagonal	20-1/4"	
Projected area	262 sq. in.	
Operating Position	Any	
Cap	Recessed Small Cavity (JEDEC No.J1-21)	
Base	Small-Shell Duodecal 6-Pin, Arrangement 1, (JEDEC Group 4, No.B6-63)	
Basing 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



Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

Maximum and Minimum Ratings, ***Design-Center Values:***

ULTOR VOLTAGE	20000 max. 14000 min.	volts volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts

21ALP4-B/21ALP4-A

PICTURE TUBE

GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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

21AP4
PICTURE TUBE

RECTANGULAR METAL-SHELL TYPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 ± 10% . . . . . amp ←

Faceplate, Spherical . . . . . Frosted Filterglass
Phosphor (For Curves, see front of this Section) . P4—Sulfide Type
Deflection Angles (Approx.):
- Diagonal . . . . . 70°
- Horizontal . . . . . 66°
- Vertical . . . . . 50°

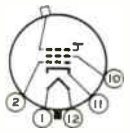
Electron Gun . . . . . Ion-Trap Type Requiring External Single-Field Magnet

Tube Dimensions:
- Maximum overall length . . . . . 22-5/8" ←
- Greatest width at lip. . . . . 19-23/32" ± 1/8"
- Greatest height at lip . . . . . 15-5/16" ± 1/8"
- Diagonal at lip. . . . . 20-3/4" ± 1/4"
- Neck length. . . . . 7-1/2" ± 3/16" ←
- Radius of curvature of faceplate (External surface). . 33" ←

Screen Dimensions (Minimum):
- Greatest width . . . . . 18-1/8"
- Greatest height. . . . . 13-11/16"
- Diagonal . . . . . 19-1/8"

Operating Position . . . . . Any
Ultor Terminal . . . . . Metal-Shell Lip
Base . . Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57) ←
Basing Designation for BOTTOM VIEW . . . . . 12D ←

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 Ratings, *Design-Center Values:*

ULTOR VOLTAGE.	18000 max.	volts
GRID-No.2 VOLTAGE.	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value.	125 max.	volts
Positive-bias value.	0 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 seconds	410 max.	volts
After equipment warm-up period . . .	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

← Indicates a change.

21AP4

PICTURE TUBE

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

21ATP4-A/21ATP4

PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

The 21ATP4-A/21ATP4 is the same as the 21ALP4-B/21ALP4-A except for the following item:

Capacitance between External Conductive Coating and Ultor	1500 max. 1200 min.	μμf μμf

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

21AVP4/21AUP4

PICTURE TUBE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

The 21AVP4/21AUP4 is the same as the 21AVP4-B/21AUP4-B/21AVP4-A/21AUP4-A except that it utilizes a *non-aluminized phosphor* and has a *maximum ultor-voltage rating of 18,000 volts.*

21AVP4-A/21AUP4-A

KINESCOPE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

The 21AVP4-A/21AUP4-A is the same as the 21AVP4/21AUP4 except for the following item:

Phosphor (For Curves, see front of this Section) . . P4—Sulfide Type Aluminized

CURVES

for Type 21AVP4-A/21AUP4-A are the same as those shown for Type 21ALP4-A

21AVP4C

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
72° MAGNETIC DEFLECTION

Electrical:

Heater Current at 6.3 volts	600	ma
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. 2000 min.	pf pf
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

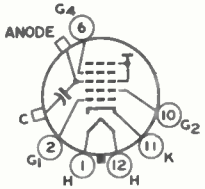
Faceplate, Soherical	Filterglass
Light transmission (Approx.)	74%
Phosphor (For curves, see front of this section)	P4-Sulfide Type, Aluminized

Mechanical:

Operating Position	Any
Weight (Approx.)	24 lbs
Overall Length	23-1/32" ± 3/8"
Neck Length	7-1/2" ± 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 J171 B/F* sheets at the front of this section

Cap . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . . . . Small-Shell Duodecal 6-Pin, Arrangement 1, (JEDEC Group 4, No.B6-63)
Basing 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

Cap – Anode (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

21AVP4C

Maximum Ratings, *Design-Maximum Values:*

Anode Voltage	22000 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 peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 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 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With anode voltage of	*18000*	*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 -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

21AXP22-A

COLOR KINESCOPE

THREE-GUN SHADOW-MASK TYPE — ELECTROSTATIC FOCUS
MAGNETIC CONVERGENCE — MAGNETIC DEFLECTION
ALUMINIZED TRICOLOR PHOSPHOR-DOT SCREEN

Supersedes Type 21AXP22

DATA

General:

Electron Guns, Three with Axes Tilted Toward Tube Axis		Blue, Green, Red
Heater, for Unipotential Cathode of Each Gun, Paralleled with Each of the Other Two Heaters within Tube:		
Voltage	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	7	μμf
Cathode of blue gun + cathode of green gun + cathode of red gun to all other electrodes	16	μμf
Grid No.3 (Of each gun tied within tube to No.3 grids of other two guns) to all other electrodes	9	μμf
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		77%
Screen, on Inner Surface of Faceplate:		
Type		Aluminized, Tricolor, Phosphor-Dot
Phosphor (Three separate phosphors, collectively)		P22
Fluorescence and phosphorescence of separate phosphors, respectively		Blue, Green, Red
Persistence of group phosphorescence		Medium
Dot arrangement		Triangular group consisting of blue dot, green dot, and red dot
Spacing between centers of adjacent dot trios (Approx.)		0.029"
Size (Minimum):		
Greatest width		19-1/16"
Height		15-1/4"
Projected area		255 sq. in.
Focusing Method		Electrostatic
Convergence Method		Magnetic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Horizontal		70°
Vertical		55°
Tube Dimensions:		
Maximum overall length		25-5/16"
Diameter:		
At lip		20-9/16" ± 1/8"
At flange		20-15/16" ± 5/16"
Weight (Approx.)		28 lbs
Mounting Position		Tube axis horizontal (base pin 12 on top)

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21AXP22-A

COLOR KINESCOPE

Ultor Terminal. . . . . Metal Shell
Base. . . . Small-Shell Neodiheptal 12-Pin (JETEC No.B12-131)
Socket. . . . . Alden Nos.214NMINSC (Radial leads), 214NMINC (Axial leads), or equivalent
Basing Designation for BOTTOM VIEW. 14AH

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 - Grids 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
METAL SHELL: Ultor (Grid No.4, Grid No.5, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-CATHODE (Of each gun) VOLTAGE. . .	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 (Each gun) . .	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 gun):		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	410 max.	volts
After equipment warm-up period.	180 max.	volts
Heater positive with respect to cathode .	180 max.	volts

Equipment Design Ranges:

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

Grid-No.3 (Focusing electrode)-to-Cathode (Of each gun) Voltage .	15.2% to 21.2% of E_{c_4k} each gun	volts
Grid-No.2-to-Cathode Voltage (Each gun) when circuit design utilizes grid-No.1-to-cathode voltage (E_{c_1k}) at fixed value for raster cutoff.	*See Cutoff Design Chart*	

*, *: See next page.

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21AXP22-A

COLOR KINESCOPE

Grid-No.1-to-Cathode Voltage (Each gun) for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2-to-cathode voltage (E_{c_2k}) at fixed value.	*See Cutoff Design Chart*	
Variation in Raster Cutoff Between Guns in Any Tube.	± 21% of average of highest and lowest cutoff values	
Grid-No.3 Current for ultor current of 800 μamp.	-45 to +75	μamp
Grid-No.2 Current (Each gun) . . .	-5 to +5	μamp
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
Blue gun	11 to 24	per cent
Green gun.	20 to 33	per cent
To produce White of 8500°K + 27 M.P.C.D. (I.C.I. Coordinates x = 0.287, y = 0.316):		
Red gun.	42 to 60	per cent
Blue gun	12 to 27	per cent
Green gun.	23 to 38	per cent
Maximum Raster Shift in Any Direction from Screen Center□. .	1	inch
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	±0.0005" to ±0.007"	
Radial	±0.0005" to ±0.005"	

* A value of average ultor current per gun higher than 500 microamperes will increase picture brightness but may impair resolution and shorten cathode life.

□ 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 convergence and color purity.

Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 20000 volts.

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21AXP22-A

COLOR KINESCOPE

Lateral-Converging Magnet:®♦

After adjustment has been made for color purity and dynamic convergence—

Max. shift of blue beam. . . . . ±1/4"

Max. shift of red and green beams. . . . . ±1/8" to ±3/8"

Average of max. shift of red 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 sawtooth waveshape synchronized with scanning.

Horizontal:

Blue pattern—

Parabola amplitude to provide▲. . . . . Shift of 1/4" to 9/16"

Sawtooth amplitude to provide∞. . . . . Shift of ±50% of the shift caused by parabola amplitude

Red pattern & green pattern—

Parabola:

Amplitude to provide▲. . . . Shift of 1/8" to 3/8"

Ratio of red-pattern shift to green-pattern shift. . . . . 1/2 to 2

Sawtooth:

Amplitude for red pattern to provide∞ . . . . . Shift of −35% to +85% of the shift caused by parabola amplitude

Amplitude for green pattern to provide∞ . . . . . Shift of −85% to +35% of the shift caused by parabola amplitude

Difference between red-pattern shift and green-pattern shift ($Shift_R - Shift_G$). . . . . 0 to +100%

Vertical:

Blue pattern—

Parabola amplitude to provide▲. . . . . Shift of 0 to 1/8"

●,♦,†,▲,∞: See next page.

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COLOR KINESCOPE

For dynamic convergence† (Cont'd):

Vertical:

Sawtooth amplitude to provide∞	Shift of 0 to 1/4"
Red pattern & green pattern—	
Parabola:	
Amplitude to provide▲	Shift of 1/8" to 3/8"
Ratio of red-pattern shift to green-pattern shift	1/2 to 2
Sawtooth:	
Amplitude to provide∞	Shift of −1/8" to +3/16"
Difference between red-pattern shift and green-pattern shift ($Shift_R - Shift_G$)	0 to +100%

Examples of Use of Design Ranges:

For ultor voltage of	*20000*	*25000*	*volts*
Grid-No.3 (Focusing Electrode)-to-Cathode (Of Each Gun) Voltage	3040 to 4240	3800 to 5300	volts
Grid-No.2-to-Cathode Voltage (Each Gun) when circuit design utilizes grid-No.1-to-cathode voltage of −70 volts for raster cutoff	130 to 370	130 to 370	volts
Grid-No.1-to-Cathode Voltage (Each Gun) for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2-to-cathode voltage of 200 volts	−45 to −100	−45 to −100	volts

Limiting Circuit Values:

High-Voltage Circuits:

In order to minimize the possibility of damage to the tube caused by a momentary internal arc, it is recommended that the *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 in tube 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.

●,♦,†,▲,∞: See next page.

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21AXP22-A
COLOR KINESCOPE

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 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.

● Shift is the movement of the regions of bar-or-dot-generator pattern indicated in notes (▲) and (oo).

♦ 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.

oo 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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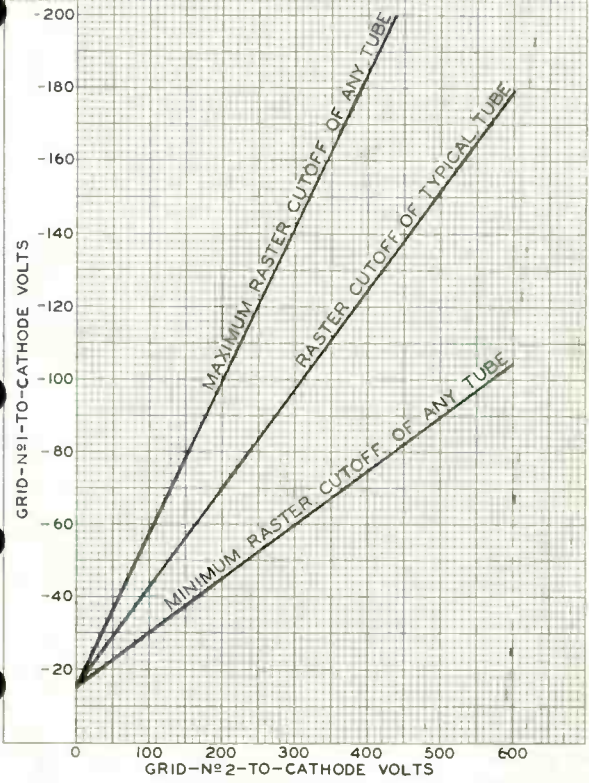
CUTOFF DESIGN CHART

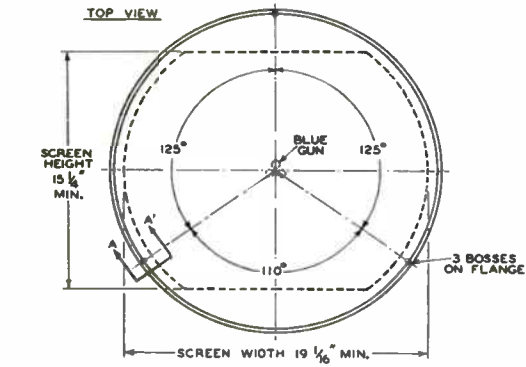
E_f = 6.3 VOLTS
ULTOR-TO-CATHODE (OF EACH GUN) VOLTS = 20000 TO 25000
GRID-№3-TO-CATHODE (OF EACH GUN) VOLTS =
ADJUSTED FOR FOCUS

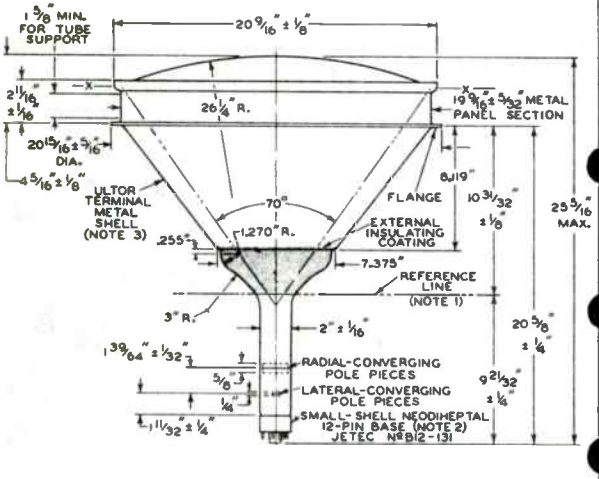


RCA

21AXP22-A

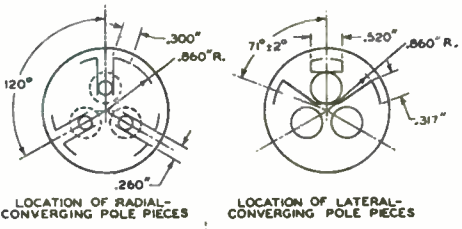
COLOR KINESCOPE





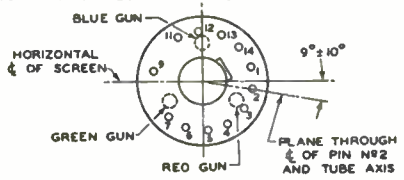
21AXP22-A

COLOR KINESCOPE

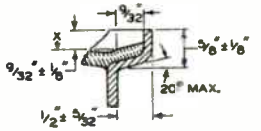


LOCATION OF RADIAL-CONVERGING POLE PIECES

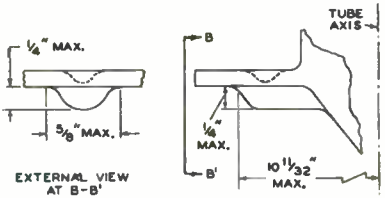
LOCATION OF LATERAL-CONVERGING POLE PIECES



BASE
BOTTOM VIEW



DETAIL OF LIP



EXTERNAL VIEW AT B-B'

EXTERNAL VIEW AT A-A'

DETAIL OF FLANGE BOSSES

92CL-8399R4

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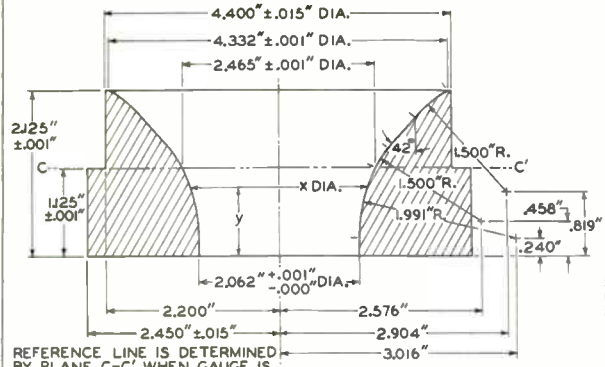
COLOR KINESCOPE

NOTE 1: WITH TUBE NECK INSERTED 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. 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.

REFERENCE-LINE AND NECK-FUNNEL-CONTOUR GAUGE



y	x	y	x
0.000"	2.062" + 0.001" - 0.000"	0.385"	2.062" + 0.001" - 0.000"
0.125"	2.062" + 0.001" - 0.000"	0.500"	2.084" ± 0.001"
0.250"	2.062" + 0.001" - 0.000"	0.625"	2.122" ± 0.001"
0.375"	2.062" + 0.001" - 0.000"	0.750"	2.182" ± 0.001"

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COLOR KINESCOPE

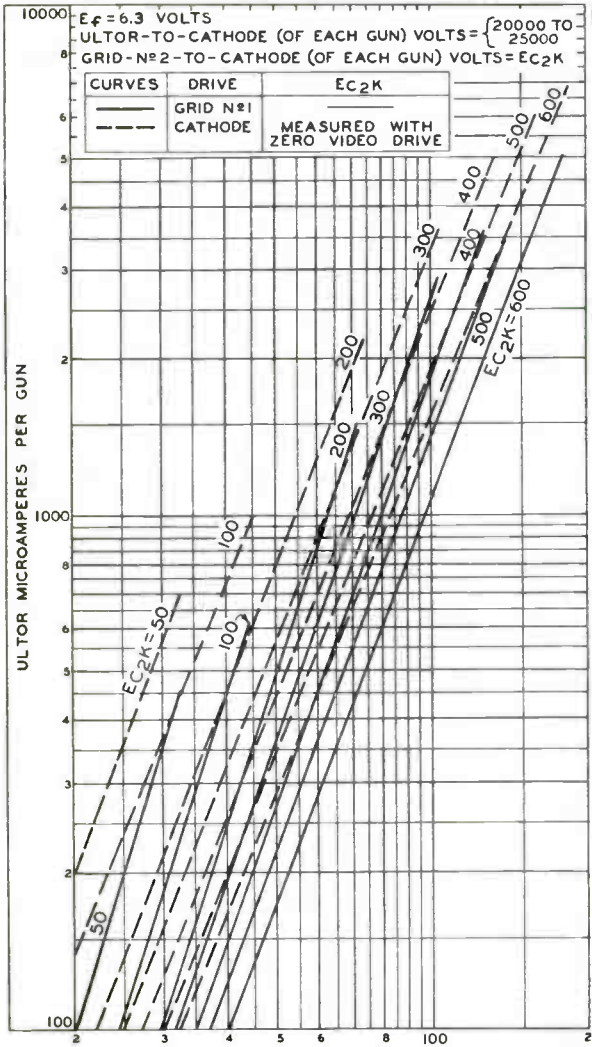
y	x
0.875"	2.258" ± 0.001"
1.000"	2.352" ± 0.001"
1.125"	2.465" ± 0.001"
1.250"	2.604" ± 0.001"
1.375"	2.778" ± 0.001"
1.500"	2.990" ± 0.001"

y	x
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" ± 0.001"

RCA

21AXP22-A

TYPICAL DRIVE CHARACTERISTICS



RCA

21AXP22-A

TYPICAL LIGHT-OUTPUT CHARACTERISTICS

E_f = 6.3 VOLTS

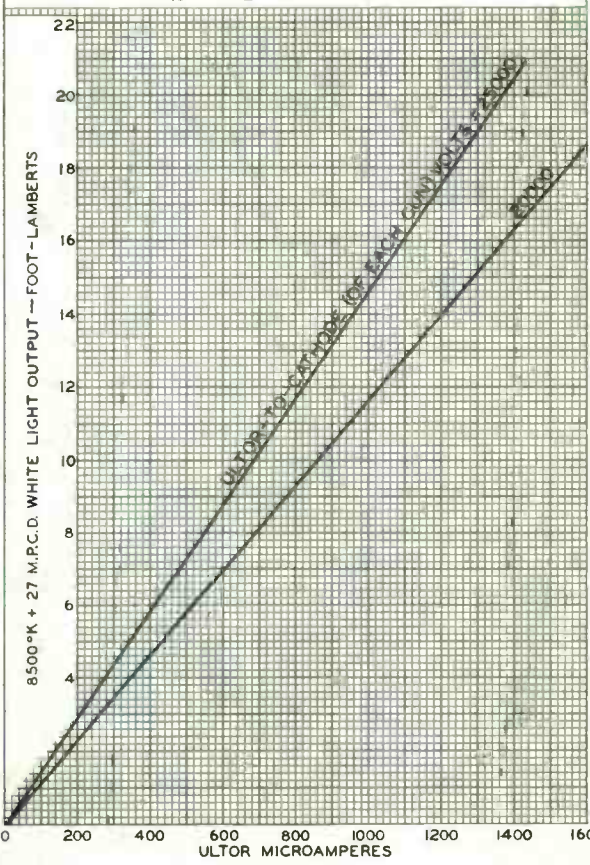
GRID-No.3-TO-CATHODE (OF EACH GUN) VOLTS = ADJUSTED FOR FOCUS

DRIVE OF EACH GUN IS ADJUSTED TO GIVE COMPOSITE ULTOR CURRENT TO PRODUCE 8500°K + 27 M.P.C.D. WHITE LIGHT OUTPUT

PERCENTAGE OF TOTAL ULTOR CURRENT SUPPLIED BY EACH GUN TO PRODUCE 8500°K + 27 M.P.C.D. WHITE:

RED GUN: 51%
BLUE GUN: 19%
GREEN GUN: 30%

RASTER SIZE: 19 1/16" x 14 1/2"



21BTP4

PICTURE TUBE

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)	6.3	volts
Current at 6.3 volts	0.6 ± 5%	amp
Warm-up time (Average)	11	sec
Capacitance between External Conductive Coating and Ultor	2500 max. 2000 min.	μμf μμf
Faceplate, Spherical		Filterglass
Phosphor (For Curves, see front of this Section)		P4—Sulfide Type Aluminized
Deflection Angles (Approx.):		
Diagonal		90°
Horizontal		85°
Vertical		68°
Electron Gun		Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:		
Overall length		20" ± 3/8"
Greatest width		20-1/4" ± 1/8"
Greatest height		16-3/8" ± 1/8"
Diagonal		21-3/8" ± 1/8"
Neck length		7-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)		33"
Screen Dimensions (Minimum):		
Greatest width		19-1/16"
Greatest height		15-1/16"
Diagonal		20-1/4"
Projected area		262 sq. in.
Operating Position		Any
Cap		Recessed Small Cavity (JEDEC No.J1-21)
Base		Small-Shell Duodecal 6-Pin, Arrangement 1, (JEDEC Group 4, No.B6-63)
Basing 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

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

Maximum and Minimum Ratings, ***Design-Center Values:***

ULTOR VOLTAGE	20000 max. 16000 min.	volts volts

21BTP4

PICTURE TUBE

GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value.	1000 max.	volts
Negative value.	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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

21CBP4-A
PICTURE TUBE

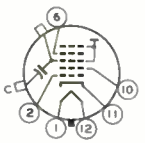
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc 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	2500 max. μμf; 2000 min. μμf
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	74%
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	90°
Horizontal	85°
Vertical	68°
Electron Gun	Type Requiring No Ion-Trap Magnet
Tube Dimensions:	
Overall length	18" ± 3/8"
Greatest width	20-1/4" ± 1/8"
Greatest height	16-3/8" ± 1/8"
Diagonal	21-3/8" ± 1/8"
Screen Dimensions (Minimum):	
Greatest width	19-1/16"
Greatest height	15-1/16"
Diagonal	20-1/4"
Neck length	5-1/2" ± 3/16"
Projected area	262 sq. in.
Weight (Approx.)	24 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Bulb	J171 (90°)
Base	Small-Shell Duodecal 6-Pin (JETEC No.B6-63)
Basing 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



Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

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21CBP4-A
PICTURE TUBE

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	20000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	200 max.	volts
Negative bias value	140 max.	volts
Positive bias value	0 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 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 voltage (E_{c_3k}) between 12000# and 20000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus§	0 to 450	volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*18000*	*volts*
and grid-No.2 voltage of	*300*	*400*	*volts*
Grid-No.4 Voltage for focus	0 to 450	0 to 450	volts

▲,*,#,§: See next page.

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PICTURE TUBE

Grid-No.1 Voltage for visual extinction of focused raster	-28 to -72	-35 to -94	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	28 to 72	35 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 Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	20000 max.	volts
GRID-No.4-TO-GRID-No.1 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	140 max.	volts
Negative bias value	0 max.	volts
Negative 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.	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.1 voltage ($E_{c_5g_1}$) between 12000# and 20000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 220 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§	0 to 450	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	

▲,*,#,§,■: See next page.

21CBP4-A

PICTURE TUBE

Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage		
Grid-No.4 Current	−25 to +25		μa
Grid-No.2 Current	−15 to +15		μa
Field Strength of Adjustable Centering Magnet*	0 to 8		gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	0 to 450	0 to 450	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	28 to 60	36 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	−28 to −60	−36 to −78	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.

* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/2". 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.

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 voltage (or ultor-to-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.

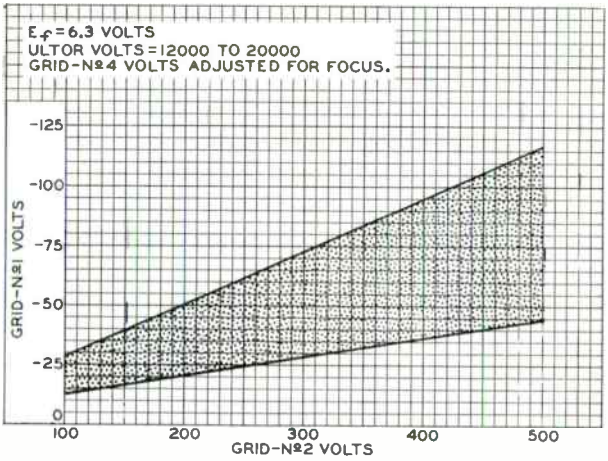
■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

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

21CBP4-A

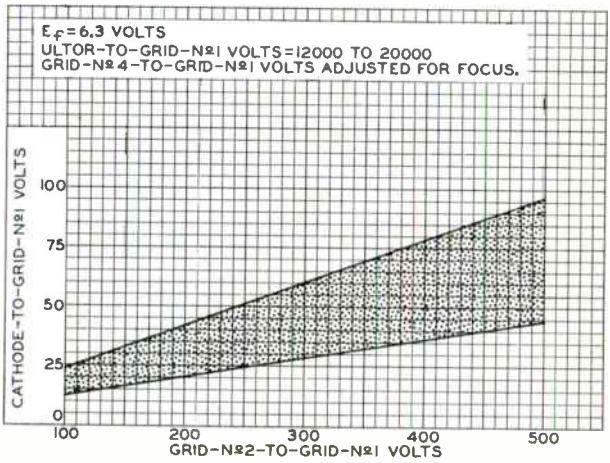
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



92CS-9349V

CATHODE-DRIVE SERVICE



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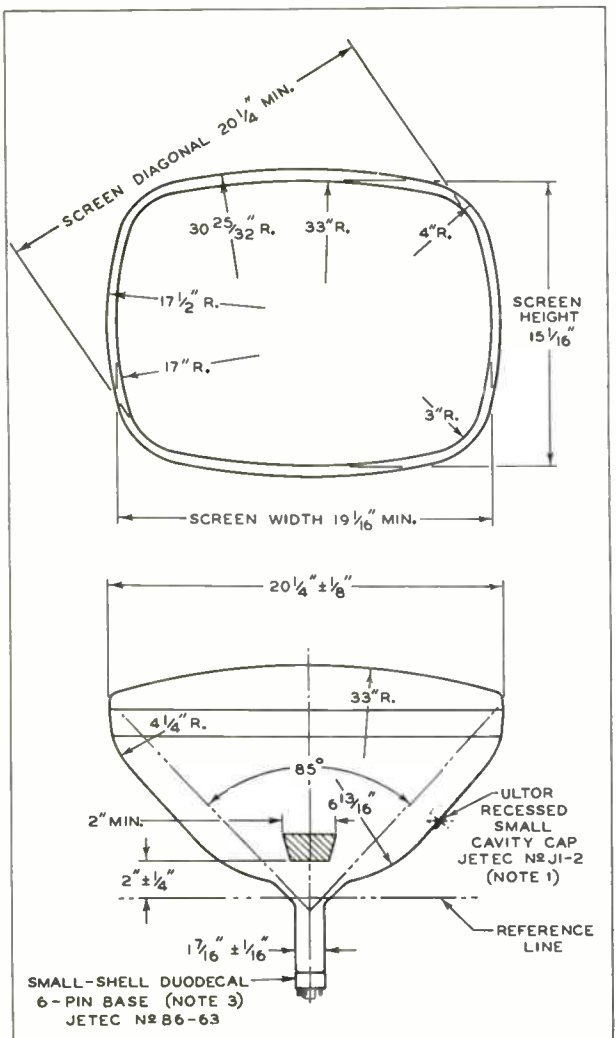
21CBP4-A
PICTURE TUBE



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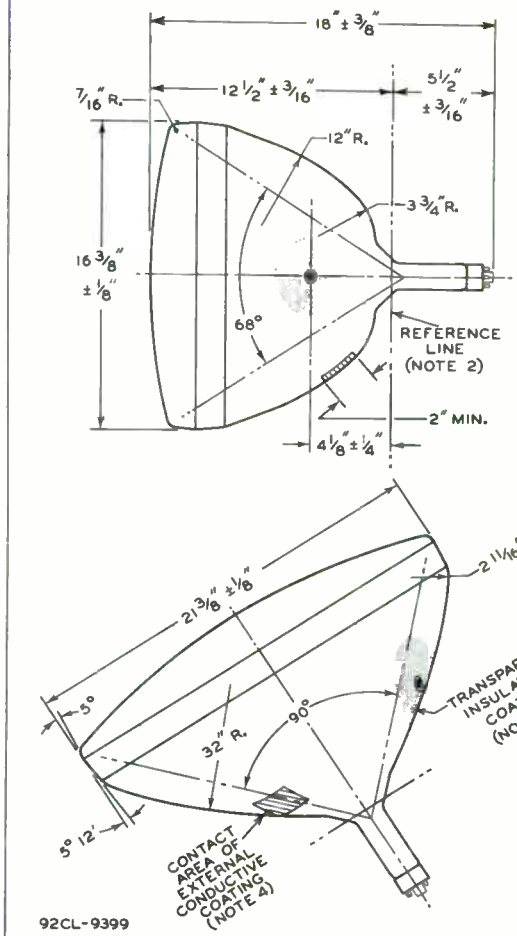
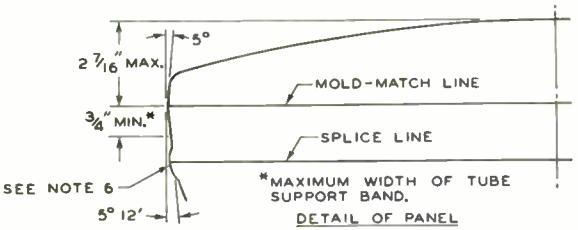
21CBP4-A

PICTURE TUBE



21CBP4-A
PICTURE TUBE



DETAIL OF PANEL

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 JETEC No. 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: 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.

NOTE 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.

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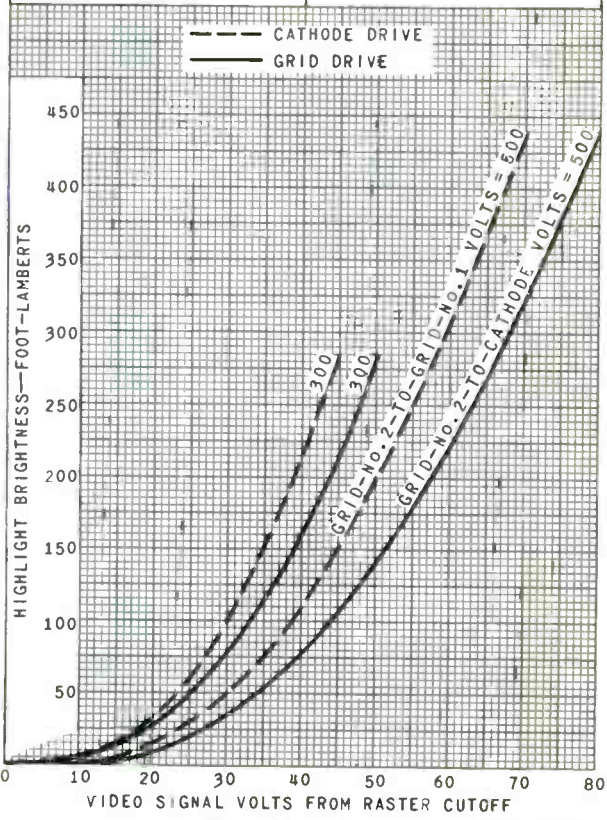
21CBP4-A
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-NO.1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID NO.1 TO GIVE FOCUSED RASTER CUTOFF.	GRID-NO.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 18"x13-1/2"	RASTER SIZE = 18"x13-1/2"



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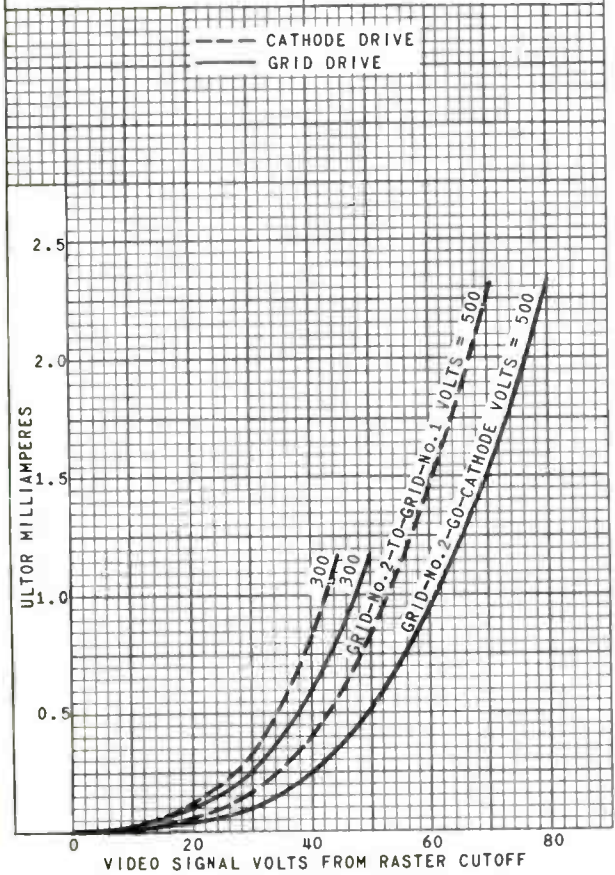
92CS-9143R1

RCA

21CBP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-NO.1 VOLTS = 12000 TO 20000	ULTOR VOLTS = 12000 TO 20000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID NO.1 TO GIVE FOCUSED RASTER CUTOFF.	GRID NO.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



21CEP4
PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 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	2500 max. μμf 2000 min. μμf
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	73%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	110°
Horizontal	105°
Vertical	87°
Electron Gun	Type Requiring No Ion-Trap Magnet
Tube Dimensions:	
Overall length	14-7/16" ± 5/16"
Greatest width	20-1/4" ± 1/8"
Greatest height	16-3/8" ± 1/8"
Diagonal	21-3/8" ± 1/8"
Neck length	5-7/16" ± 1/8"
Screen Dimensions (Minimum):	
Greatest width	19-1/16"
Greatest height	15-1/16"
Diagonal	20-1/4"
Projected area	262 sq. in.
Weight (Approx.)	23 lbs
Mounting Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Bulb	J171 (110°)
Socket	Ucinite Part No.115446, or equivalent
Base	Small-Button Eightar 7-Pin, Arrangement 2, (JETEC No.B7-183)
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

Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

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

RCA

21CEP4

PICTURE TUBE

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	{18000 max. / 12000* min.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	200 max.	volts
Negative bias value	140 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

Equipment Design Ranges:

With any ultor voltage (E_{c_5k}) between 12000 and 18000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for Focus§	0 to 400	volts
Grid-No.1 Voltage (E_{c_1k}) for Visual Extinction of Focused Raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of / *and grid-No.2 voltage of*	*14000* / *300*	*16000* / *400*	*volts* / *volts*
Grid-No.4 Voltage for Focus	0 to 400	0 to 400	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	−28 to −72	−36 to −94	volts

▲ Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

,§,: See next page.

21CEP4

PICTURE TUBE

With ultor voltage of	*14000*	*16000*	*volts*
and grid-No.2 voltage of	*300*	*400*	*volts*
Grid-No.1 Videc Drive from Raster Cutoff (Black Level): White-level value. . . .	28 to 72	36 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 Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	18000	max.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:	12000*	min.	volts
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.	140	max.	volts
Negative bias value.	0	max.	volts
Negative 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

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) between	*12000 and 18000 volts*
and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between	*225 and 640 volts*
Grid-No.4-to-Grid-No.1 Voltage for Focus§	0 to 400 volts
Cathode-to-Grid-No.1 Voltage (Ek_{g_1}) for Visual Extinction of Focused Raster.	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*

■ 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.

§ 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-to-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.

,: See next page.

21CEP4

PICTURE TUBE

Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value. . . .	Same value as determined for Ekg_1 except video drive is a negative voltage		
Grid-No.4 Current.	−25 to +25		μa
Grid-No.2 Current.	−15 to +15		μa
Field Strength of Adjustable Centering Magnet* .	0 to 8		gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*14000*	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for Focus . .	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	28 to 60	36 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value.	−28 to −60	−36 to −78	volts

Maximum Circuit Values:

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

* This value is a working design-center minimum. The equivalent *absolute minimum* ultor- or ultor-to-grid-No.1 voltage is 11000 volts, below which the serviceability of the 21CEP4 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 11000 volts.

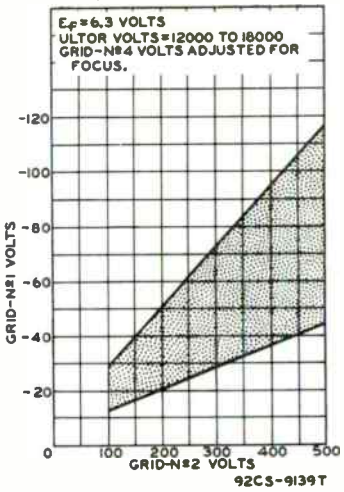
* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/8". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

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

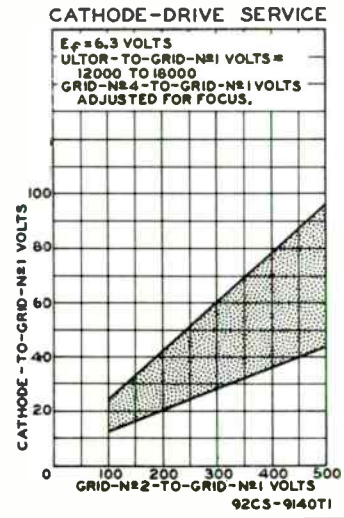
21CEP4

RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



CATHODE-DRIVE SERVICE



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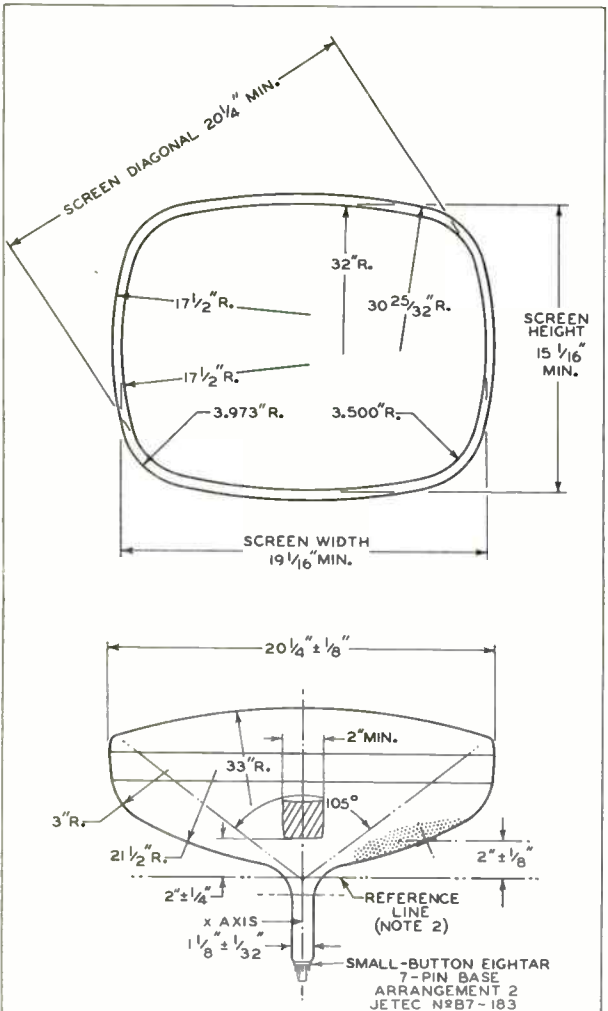
RCA

21CEP4

PICTURE TUBE



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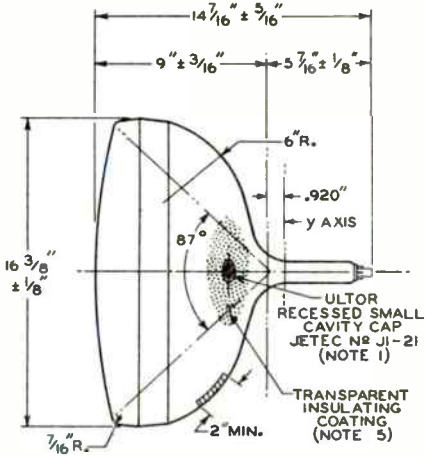
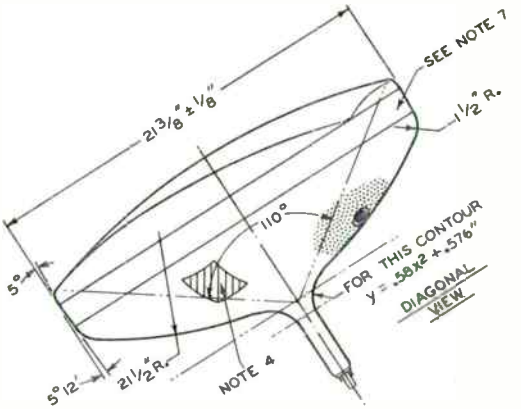
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

21CEP4

PICTURE TUBE





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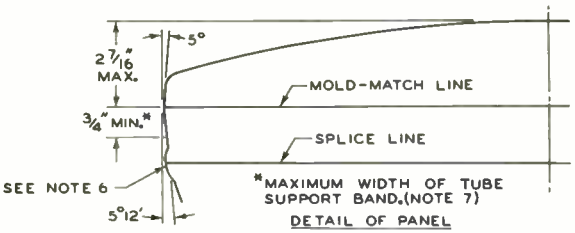
RCA

21CEP4

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 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".

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.

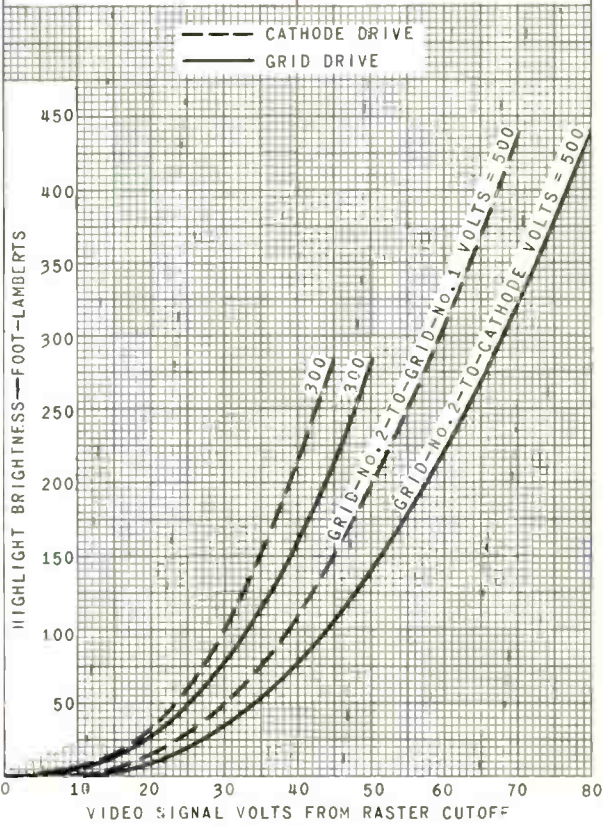
NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

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

21CEP4
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-No.1 VOLTS = 16000	ULTOR VOLTS = 16000 GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER SIZE = 18"x13-1/2"
RASTER SIZE = 18"x13-1/2"	



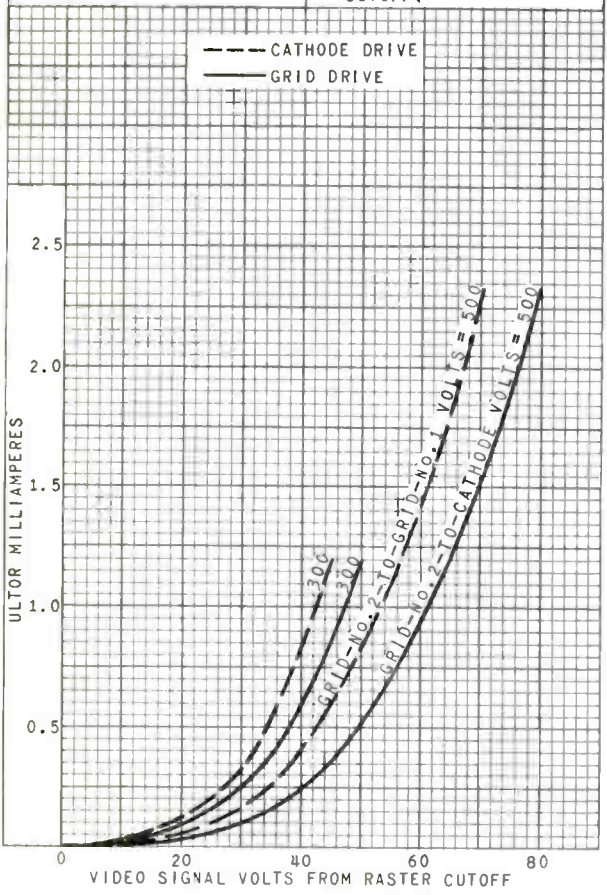
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

21CEP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-NO.1 VOLTS = 12000 TO 18000	ULTOR VOLTS = 12000 TO 18000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID NO.1 TO GIVE FOCUSED RASTER CUTOFF.	GRID NO.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



21CQP4
PICTURE TUBE

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)	6.3	volts
Current	0.6 ± 5%	amp
Warm-up time (Average)	11	sec
Capacitance between External Conductive Coating and Ultor	2500 max. 2000 min.	μμf μμf
Faceplate, Spherical	Filterglass	
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized	
Deflection Angles (Approx.):		
Diagonal	110°	
Horizontal	105°	
Vertical	87°	
Electron Gun	Type Requiring No Ion-Trap Magnet	
Tube Dimensions:		
Overall length	14-7/16" ± 3/8"	
Greatest width	20-1/4" ± 1/8"	
Greatest height	16-3/8" ± 1/8"	
Diagonal	21-3/8" ± 1/8"	
Neck length	5-3/16" ± 3/16"	
Radius of curvature of faceplate (External surface)	28-1/2"	
Screen Dimensions (Minimum):		
Greatest width	19-1/16"	
Greatest height	15-1/16"	
Diagonal	20-1/4"	
Projected area	262 sq. in.	
Operating Position	Any	
Cap	Recessed Small Cavity (JEDEC No.J1-21)	
Base	Special (JEDEC No.B6-185)	
Basing Designation for BOTTOM VIEW	7FA	

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, *Design-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts

21CQP4

PICTURE TUBE

GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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

21CXP4
PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION
LOW GRID-No.2 VOLTAGE — CATHODE-DRIVE TYPE

With heater having controlled warm-up time

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 ± 10% . . . . . amp
- Warm-up time (Average) . 11 . . . . . sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of Receiving Tube Section.

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . . . 6 μμf
- Cathode to all electrodes . . . . . 5 μμf
- External conductive coating to ultor . . . . 2500 max. μμf; 2000 min. μμf

Faceplate, Spherical . . . . . Filterglass
- Light transmission (Approx.) 74%

Phosphor (For Curves, see front of this Section) . P4—Sulfide Type Aluminized
- Fluorescence . . . . . White
- Phosphorescence . . . . . White
- Persistence . . . . . Short

Focusing Method . . . . . Electrostatic
Deflection Method . . . . . Magnetic
Deflection Angles (Approx.):
- Diagonal . . . . . 90°
- Horizontal . . . . . 85°
- Vertical . . . . . 68°

Electron Gun . . . . . Type Requiring No Ion-Trap Magnet
Tube Dimensions:
- Overall length . . . . . 18" ± 3/8"
- Greatest width . . . . . 20-1/4" ± 1/8"
- Greatest height . . . . . 16-3/8" ± 1/8"
- Diagonal . . . . . 21-3/8" ± 1/8"
- Neck length . . . . . 5-1/2" ± 3/16"
- Radius of curvature of faceplate (External surface) . . 33"

Screen Dimensions (Minimum):
- Greatest width . . . . . 19-1/16"
- Greatest height . . . . . 15-1/16"
- Diagonal . . . . . 20-1/4"
- Projected area . . . . . 262 sq. in.

Weight (Approx.) . . . . . 24 lbs
Operating Position . . . . . Any
Cap . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Bulb J171D2/E1
Base . . . . . Small-Shell Duodecal 6-Pin, Arrangement 1 (JEDEC Group 4, No.B6-63), or Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)

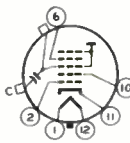
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21CXP4

PICTURE TUBE

Basing 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



Cap – 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 Ratings, ***Design-Center Values:***

ULTOR-TO-GRID-No.1 VOLTAGE	20000	max.	volts
	12000●	min.	volts
GRID-No.4-TO-GRID-No.1 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:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds	410	max.	volts
After equipment warm-up period . .	180	max.	volts
Heater positive with respect to cathode	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g1}) between 12000 and 20000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 40 and 64 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§	0 to 350	volts
Cathode-to-Grid-No.1 Voltage (E_{kg1}) 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 (Peak negative).	Same value as determined for E_{kg1} except video drive is a negative voltage	

■, ●, §, ▲: See next page.

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PICTURE TUBE

Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*18000*	*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 350	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	32 to 47	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	−32 to −47	volts

Maximum Circuit Values:

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

□ 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.

* This 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 21CXP4 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 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 these items.

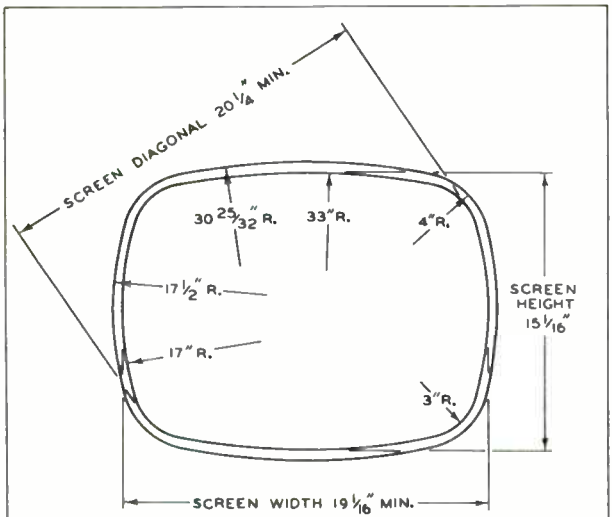
▲ The cathode-to-grid-No.1 voltage (E_{kg_1}) will increase by approximately 2 per cent for every 1000-volt increase in ultor-to-grid-No.1 voltage and will decrease by approximately 2 per cent for every 1000-volt decrease in ultor-to-grid-No.1 voltage.

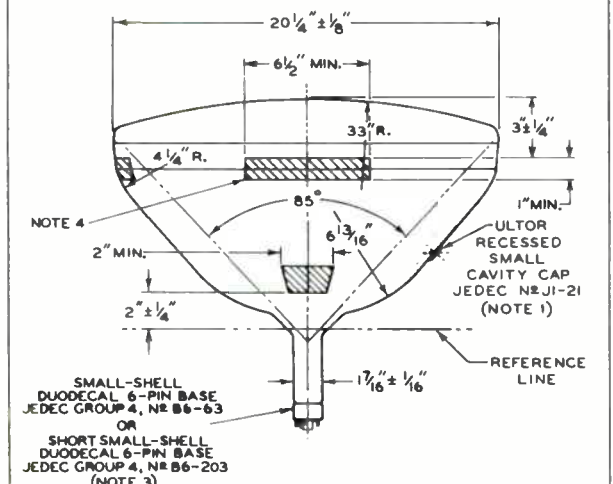
• Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/2". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

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

21CXP4

PICTURE TUBE





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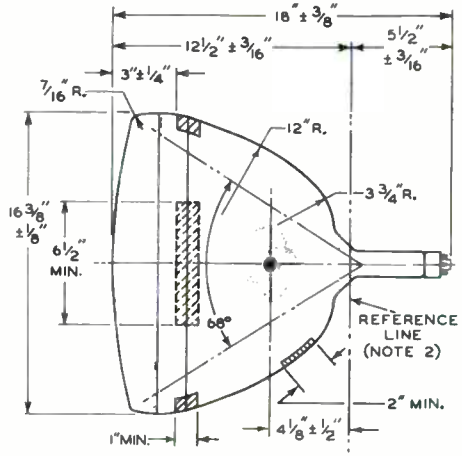
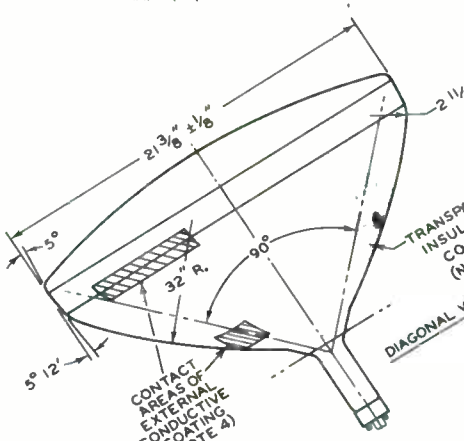
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21CXP4

PICTURE TUBE





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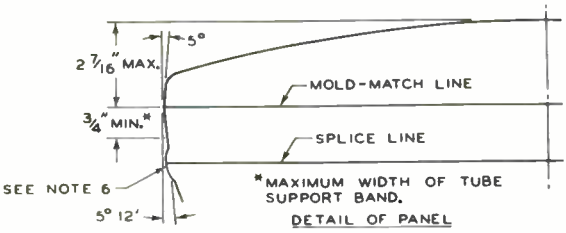
21CXP4

PICTURE TUBE



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 2-3/4".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THREE OF FOUR CONTACT AREAS OF THE EXTERNAL CONDUCTIVE COATING. IN ADDITION TO THE 2" x 2" MIN. CONTACT AREA SHOWN, A 6-1/2" x 1" MIN. CONTACT AREA IS PROVIDED IN THE VICINITY OF THE SPLICE LINE ON EACH LONG SIDE OF THE BULB AND ON AT LEAST ONE SHORT SIDE OF THE BULB AS SHOWN. THE ACTUAL AREA OF EXTERNAL CONDUCTIVE COATING WHICH CONNECTS ALL THE CONTACT AREAS WILL BE GREATER THAN THE CONTACT AREAS 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.

NOTE 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.

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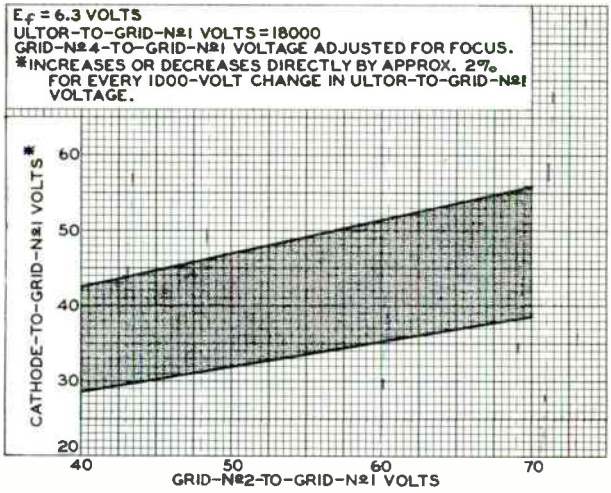
RASTER-CUTOFF-RANGE CHART



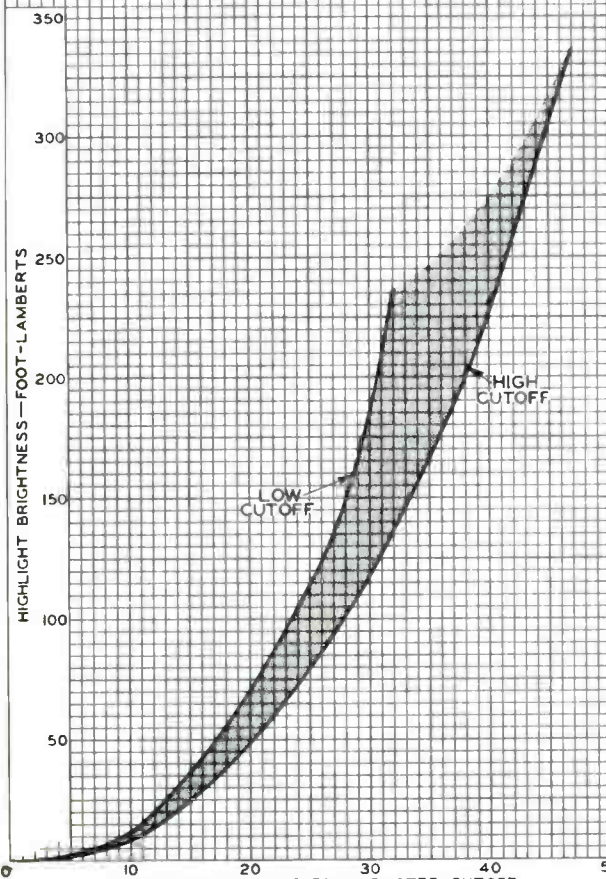
92CS-9911

RCA

21CXP4

CATHODE-DRIVE CHARACTERISTICS

E_f=6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS=18000
GRID-№2-TO-GRID-№1 VOLTS=50
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE=18"x 13-1/2"



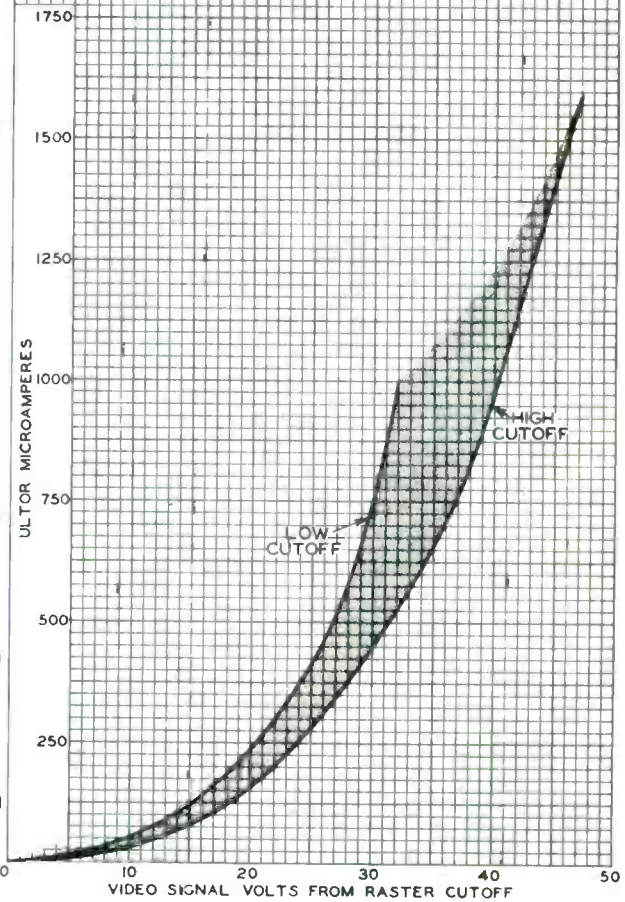
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-9904

RCA

21CXP4

CATHODE-DRIVE CHARACTERISTICS

E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 18000
GRID-№2-TO-GRID-№1 VOLTS = 50
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.



21DAP4

PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

Intended for use in equipment having series heater-string arrangement

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 amp
Warm-up time (Average)	11 sec
For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of Receiving Tube Section.	
Direct Interelectrode Capacitances:	
Grid No.1 to all other electrodes	6 μμf
Cathode to all other electrodes	5 μμf
External conductive coating to ultor	2500 max. μμf 2000 min. μμf
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	74%
Phosphor (For Curves, see front of this section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	110°
Horizontal	105°
Vertical	87°
Electron Gun	Type Requiring No Ion-Trap Magnet
Tube Dimensions:	
Overall length	14-11/16" ± 5/16"
Greatest width	20-1/4" ± 1/8"
Greatest height	16-3/8" ± 1/8"
Diagonal	21-3/8" ± 1/8"
Neck length	5-7/16" ± 1/8"
Screen Dimensions (Minimum):	
Greatest width	19-1/16"
Greatest height	15-1/16"
Diagonal	20-1/4"
Projected area	262 sq. in.
Weight (Approx.)	20 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Bulb	J171G1/K1

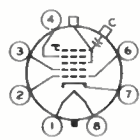
21DAP4

PICTURE TUBE

Base. . . . . Small-Button Eightar 7-Pin, Arrangement 2, (JETEC No. B7-183)

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



Cap – Ultor (Grid 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-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
	12000* min.	volts
GRID-No. 4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No. 2 VOLTAGE	500 max.	volts
GRID-No. 1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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 voltage (E_{c_5k}) between 12000 and 18000 volts and grid-No. 2 voltage (E_{c_2k}) between 200 and 500 volts*

Grid-No. 4 Voltage for focus§	0 to 400	volts
Grid-No. 1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid No. 1 Video Drive From Raster Cutoff (Black Level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	

▲, *, §: See next page.

21DAP4

PICTURE TUBE

Grid-No.4 Current.	−25 to +25	μa
Grid-No.2 Current.	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

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 extinction of focused raster	−36 to −94	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value.	36 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:*

ULTOR-TO-GRID-No.1 VOLTAGE	18000	max.	volts
	12000*	min.	volts
GRID-No.4-TO-GRID-No.1 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.	140	max.	volts
Negative-bias value.	0	max.	volts
Negative-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.	volts
After equipment warm-up period . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

▲, ●, §, ▪, ■: See next page.

21DAP4

PICTURE TUBE

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g_1}) between 12000 and 18000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g_1}) between 225 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§.	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*. . . .	0 to 8	gauss

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	*400*	*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.	36 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	-36 to -78	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 minimum* ultor- or ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 21DAP4 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.

§,▲,●: See next page.

21DAP4

PICTURE TUBE

§ 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-to-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.

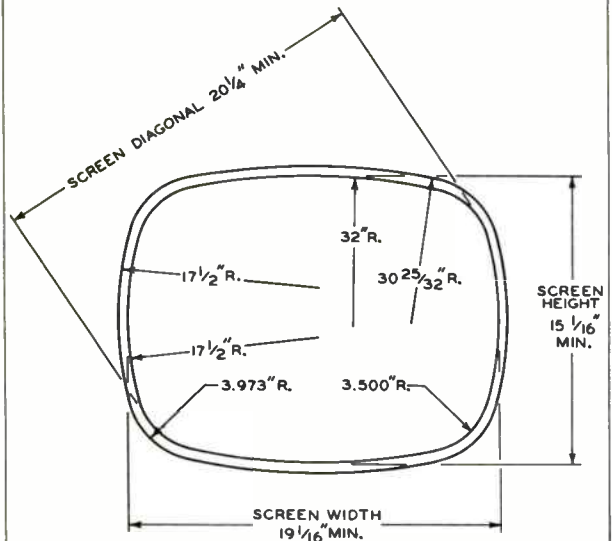
* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/2". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 7/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

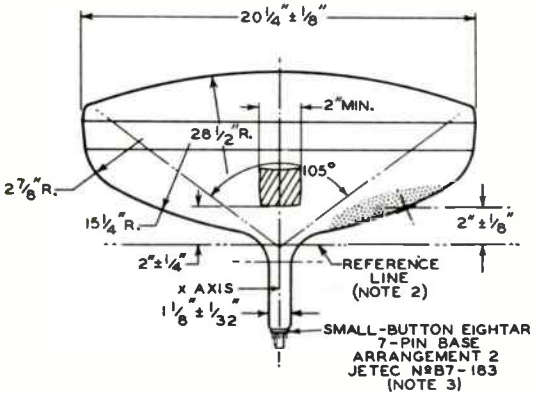
■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

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

21DAP4

PICTURE TUBE





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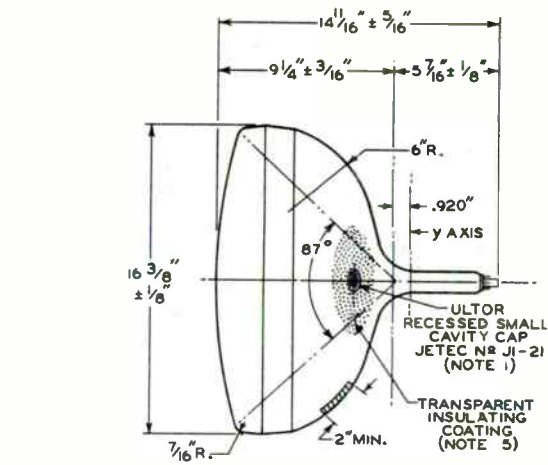
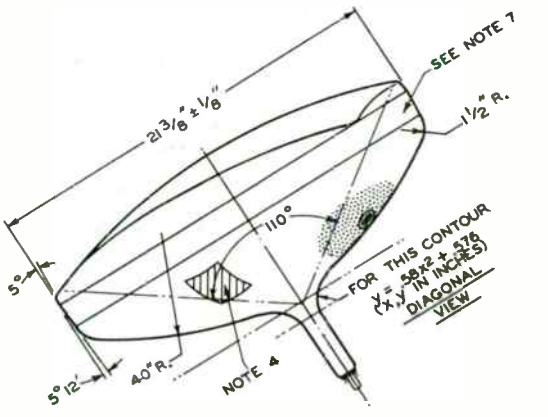
21DAP4

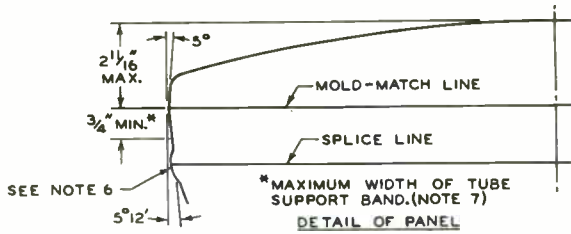
PICTURE TUBE





92CL-9645

21DAP4
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.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 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".

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.

NOTE 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.

NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

ELECTRON TUBE DIVISION
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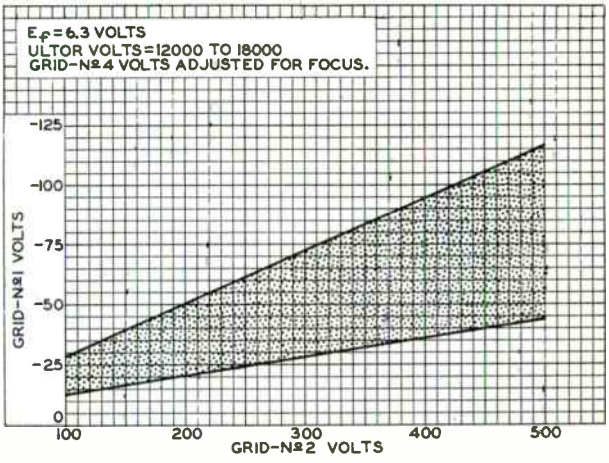
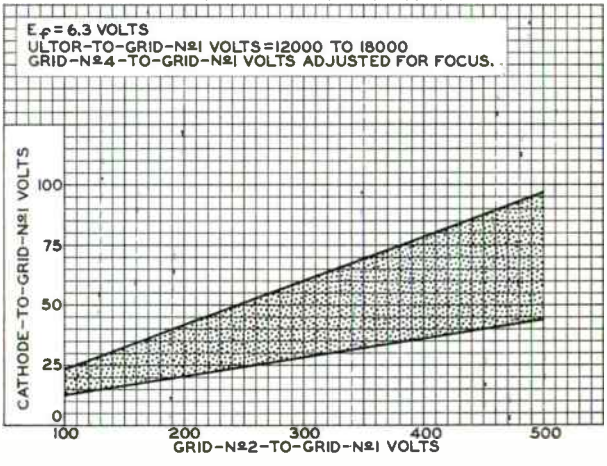
21DAP4

RASTER-CUTOFF-RANGE CHARTS
GRID-DRIVE SERVICE



92CS-9651

CATHODE-DRIVE SERVICE



92CS-9652

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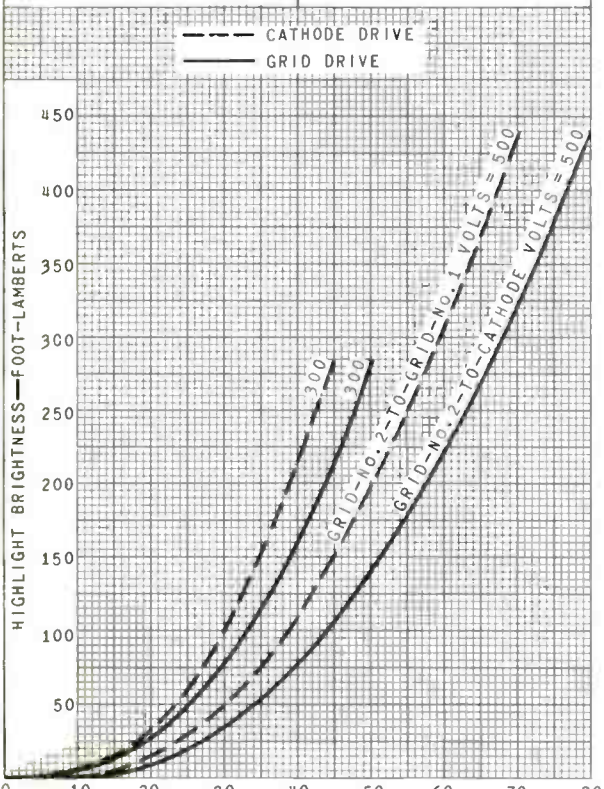
21DAP4
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-No.1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF.	GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 18"x13-1/2"	RASTER SIZE = 18"x13-1/2"



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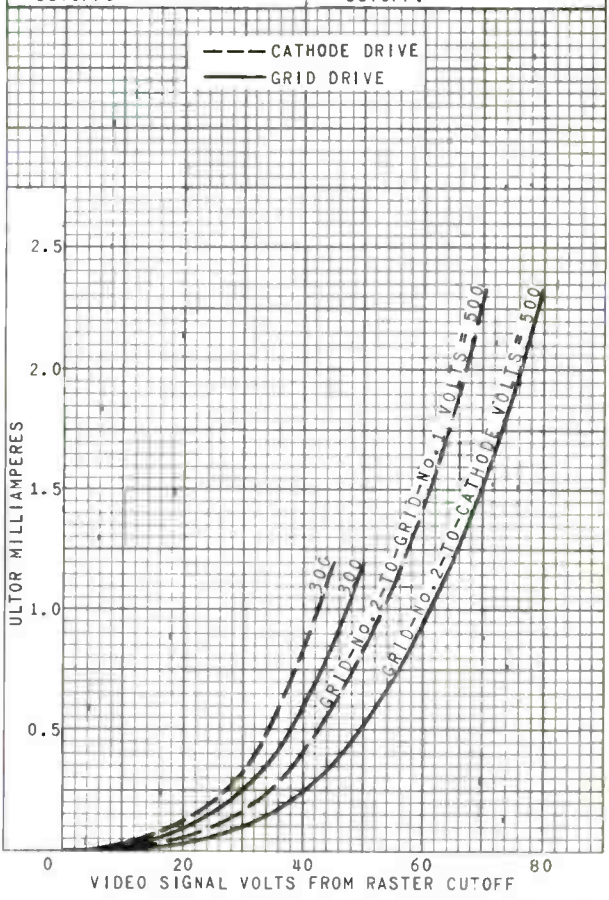
92CS-9143R1

RCA

21DAP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-NO.1 VOLTS = 12000 TO 18000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID NO.1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 6.3 VOLTS ULTOR VOLTS = 12000 TO 18000 GRID NO.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



21DEP4-A
PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

With heater having controlled warm-up time

DATA

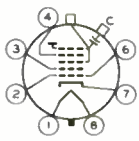
General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.6	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	2500 max. 2000 min.	μμf μμf
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		76%
Phosphor (For Curves, see front of this Section)		P4—Sulfide Type Aluminized
Fluorescence		White
Phosphorescence		White
Persistence		Medium-Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angles (Approx.)		
Diagonal		110°
Horizontal		105°
Vertical		87°
Electron Gun		Type Requiring No Ion-Trap Magnet
Tube Dimensions:		
Overall length		14-11/16" ± 5/16"
Greatest width		20-1/4" ± 1/8"
Greatest height		16-3/8" ± 1/8"
Diagonal		21-3/8" ± 1/8"
Neck length		5-7/16" + 3/16" − 1/8"
Radius of curvature of faceplate (External surface)		28-1/2"
Screen Dimensions (Minimum):		
Greatest width		19-1/16"
Greatest height		15-1/16"
Diagonal		20-1/4"
Projected area		262 sq. in.
Weight (Approx.)		22 lbs
Operating Position		Any
Cap		Recessed Small Cavity (JEDEC No.J1-21)
Bulb		J171G1/K1
Base		Small-Button Eightar 7-Pin, Arrangement 2, (JEDEC No.B7-183)

21DEP4-A
PICTURE TUBE

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



Cap – Ultor (Grid 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 Ratings, *Design-Center Values:*

ULTOR VOLTAGE.	20000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE.	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value.	200 max.	volts
Negative-bias value.	140 max.	volts
Positive-bias value.	0 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 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 voltage (E_{c_5k}) between 15000● and 20000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus§ . . .	0 to 500	volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive).	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current.	−25 to +25	μa
Grid-No.2 Current.	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

21DEP4-A

PICTURE TUBE

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*volts*
and grid-No.2 voltage of	*400*	*volts*
Grid-No.4 Voltage for focus. . .	0 to 500	volts
Grid-No.1 Voltage for visual extinction of focused raster	-36 to -94	volts
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value.	36 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 Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	20000 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	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.	140 max.	volts
Negative-bias value.	0 max.	volts
Negative-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.	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.1 voltage ($E_{c_5g_1}$) between 15000 and 20000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 225 and 640 volts*

Grid-No.4-to-Grid-No.1 Voltage for focus§	0 to 500	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster.	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	

21DEP4-A

PICTURE TUBE

Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for Ekg_1 except video drive is a negative voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable 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	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	0 to 500	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	36 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	-36 to -78	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.

● Brightness and focus quality decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 15,000 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-to-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 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.

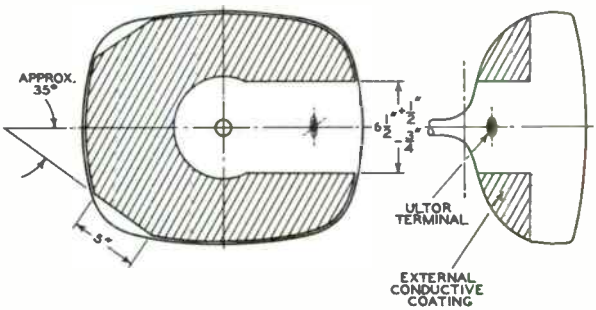
■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

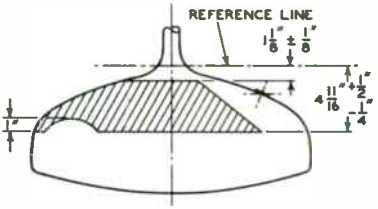
For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

21DEP4-A

PICTURE TUBE

DETAIL SHOWING EXTERNAL CONDUCTIVE COATING





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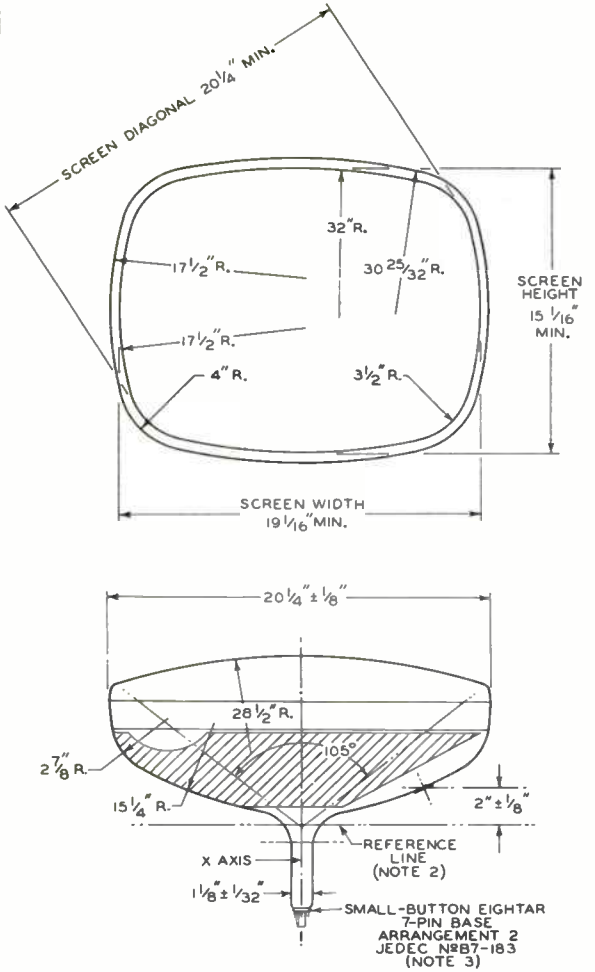
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21DEP4-A

PICTURE TUBE



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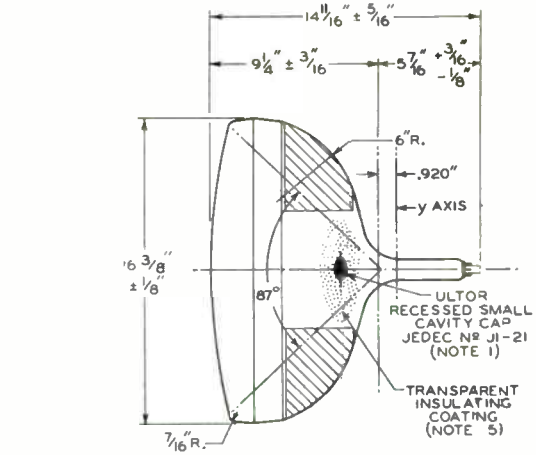
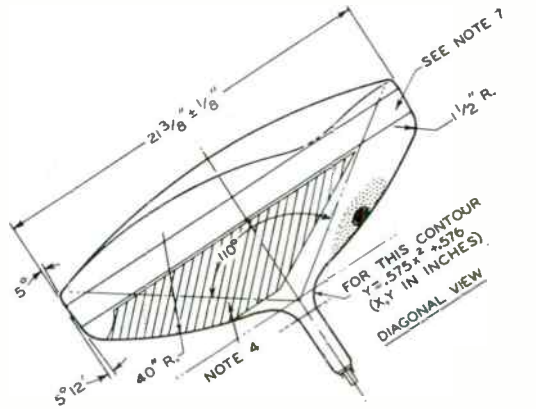
21DEP4-A

PICTURE TUBE





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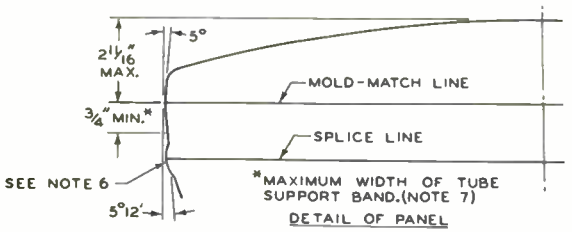
21DEP4-A
PICTURE TUBE



NOTE 1: THE PLANE THRDUGH THE TUBE AXIS AND PIN 4 MAY VARY FRDM 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 BE RIGIDLY MOUNTED; 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".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 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" BEYDND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

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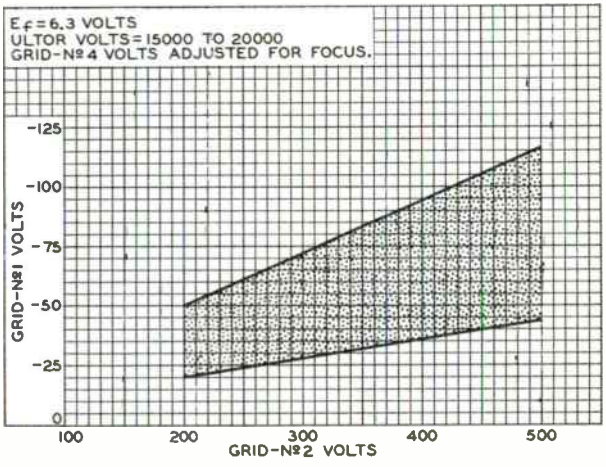
21DEP4-A

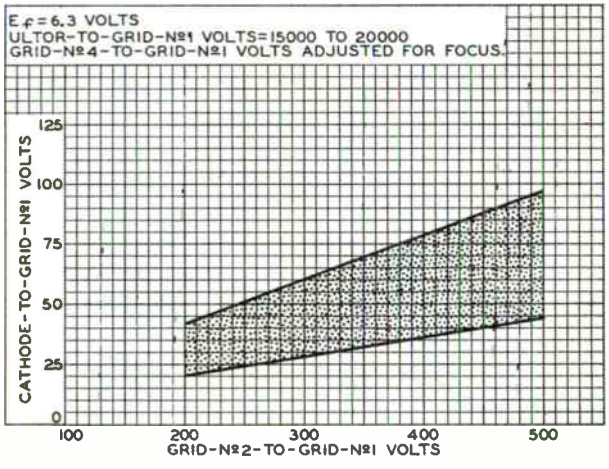
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



92CS-10324

CATHODE-DRIVE SERVICE



92CS-10325

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

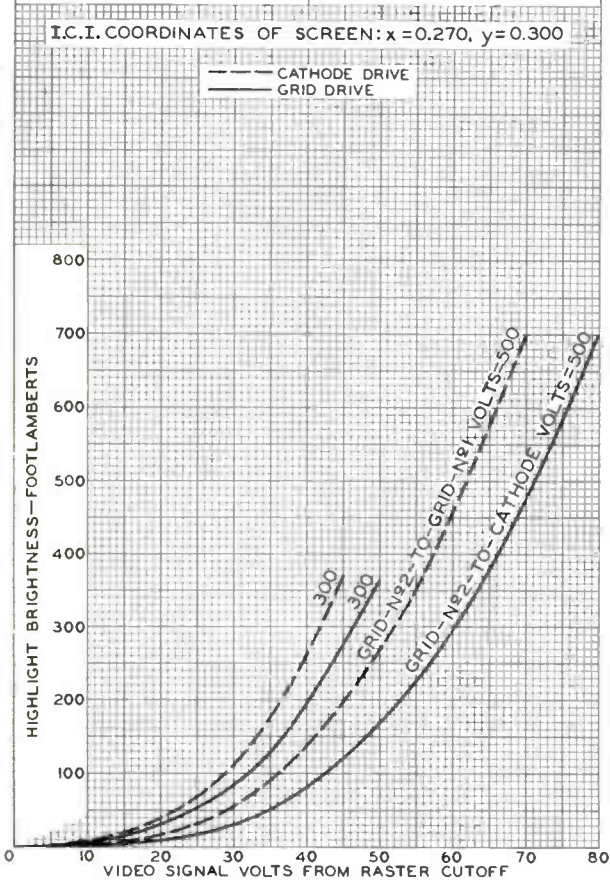
RCA

21DEP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-Nº1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID Nº 1 TO GIVE FOCUSED RASTER CUTOFF.	GRID Nº 1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 18" x 13½"	RASTER SIZE = 18" x 13½"

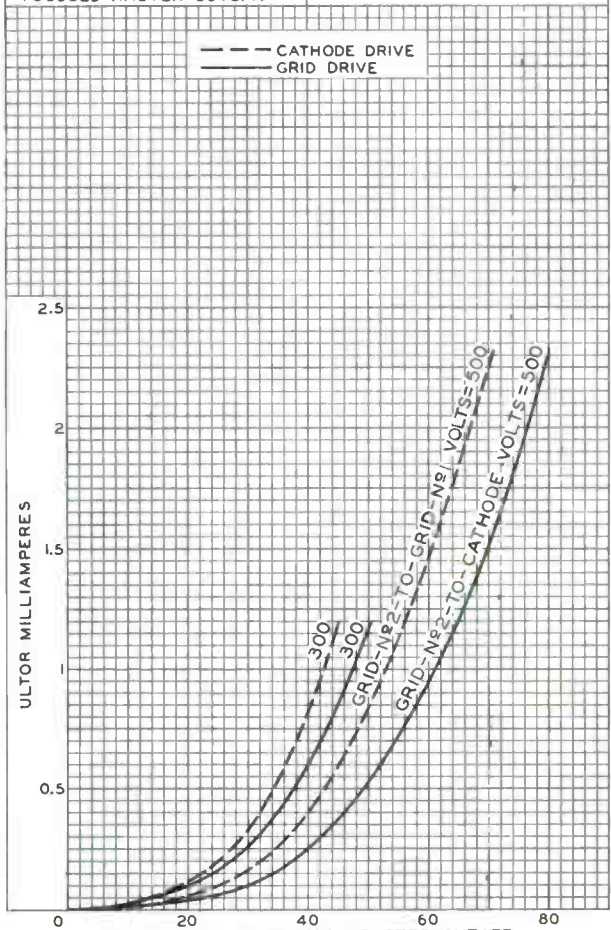
I.C.I. COORDINATES OF SCREEN: x = 0.270, y = 0.300



21DEP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f=6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS = 15000 TO 20000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f= 6.3 VOLTS ULTOR VOLTS =15000 TO 20000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



21DFP4
PICTURE TUBE

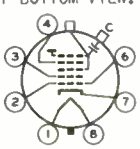
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6	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	2200 max. / 1500 min.	μμf
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		73%
Phosphor (For curves, see front of this section)		P4—Sulfide Type
		Aluminized
Fluorescence		White
Phosphorescence		White
Persistence		Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		110°
Horizontal		105°
Vertical		87°
Electron Gun		Type Requiring No Ion-Trap Magnet
Tube Dimensions:		
Overall length		14-7/16" ± 5/16"
Greatest width		20-1/4" ± 1/8"
Greatest height		16-3/8" ± 1/8"
Diagonal		21-3/8" ± 1/8"
Neck length		5-7/16" ± 1/8"
Screen Dimensions (Minimum):		
Greatest width		19-1/16"
Greatest height		15-1/16"
Diagonal		20-1/4"
Projected area		262 sq. in.
Weight (Approx.)		23 lbs
Operating Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Bulb		J171 (11C°)
Socket		Ucinite Part No.115446, or equivalent
Base		Small-Button Eightar 7-Pin, Arrangement 2, (JETEC No.B7-183)
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



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

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21DFP4

PICTURE TUBE

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	{18000 max. volts {12000⊕ min. volts	
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	200 max.	volts
Negative bias value	140 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

Equipment Design Ranges:

With any ultor voltage (E_{c_5k}) between 12000 and 18000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4-Voltage for focus§	0 to 400 volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage
Grid-No.4 Current	−25 to +25 μa
Grid-No.2 Current	−15 to +15 μa
Field Strength of Adjustable Centering Magnet*	0 to 8 gauses

Examples of Use of Design Ranges:

With ultor voltage of	*14000*	*16000*	*volts*
and grid-No.2 voltage of	*300*	*400*	*volts*
Grid-No.4 Voltage for focus	0 to 400	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster	−28 to −72	−36 to −94	volts

▲,⊕,§,*: See next page.

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PICTURE TUBE

Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	28 to 72	36 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 Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	18000	max.	volts
	12000●	min.	volts
GRID-No.4-TO-GRID-No.1 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	140	max.	volts
Negative bias value	0	max.	volts
Negative 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

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) between 12000 and 18000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 225 and 640 volts

Grid-No.4-to-Gric-No.1 Voltage for focus§	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No.4 Current	-25 to +25	μa

▲,●,§,*,■: See next page.

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RCA

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PICTURE TUBE

Grid-No.2 Current.	−15 to +15		μa
Field Strength of Adjustable Centering Magnet*.	0 to 8		gauss
Examples of Use of Design Ranges:			
With ultor-to-grid-No.1 voltage of	*14000*	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus.	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster.	28 to 60	36 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value.	−28 to −60	−36 to −78	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 minimum* ultor-, or ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 21DFP4 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 that 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-to-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 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

Curves and Charts shown under Type 21CEP4 also apply to the 21DFP4

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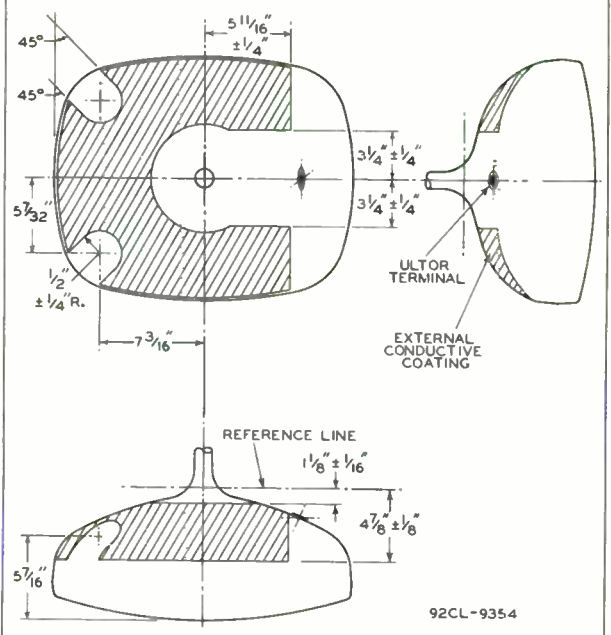
21DFP4

PICTURE TUBE



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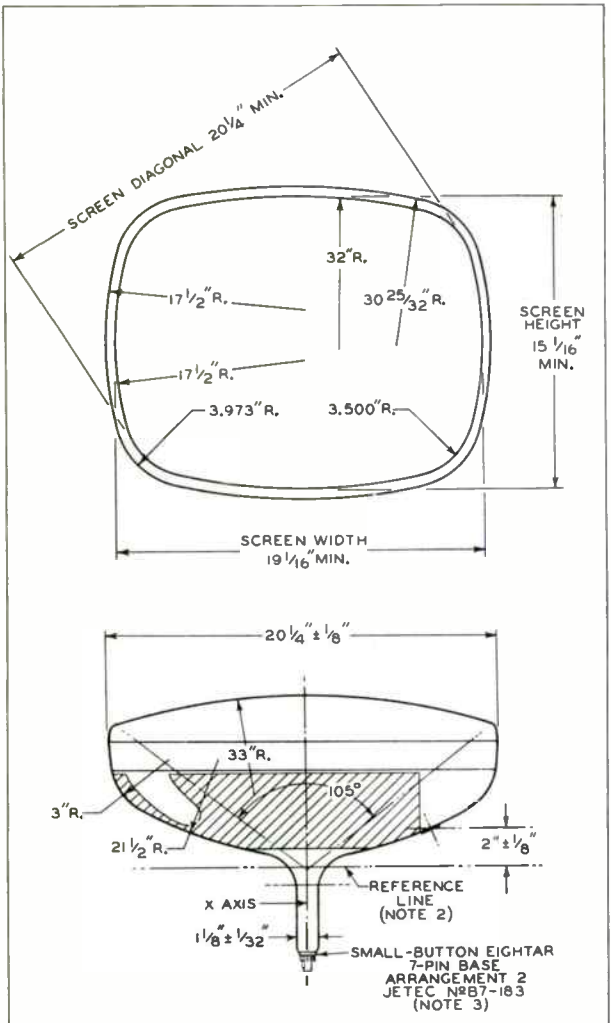
21DFP4
PICTURE TUBE



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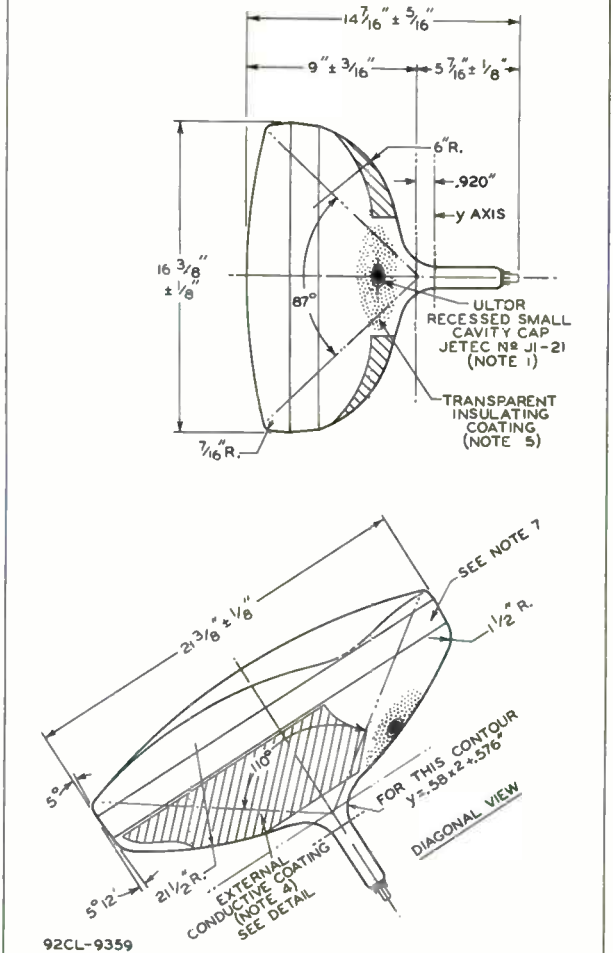
CE-9359A

RCA

21DFP4

PICTURE TUBE



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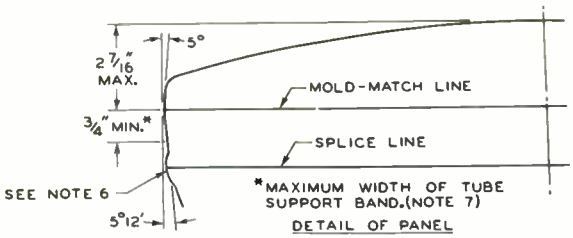
RCA

21DFP4

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 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 LINTLESS CLOTH.

NOTE 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.

NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

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Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	450 ± 5%	ma
Heater Warm-Up Time (Average)	11	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	2500 max. 1700 min.	μμf μμf

Electron Gun . . . . . .Type Requiring No Ion-Trap Magnet

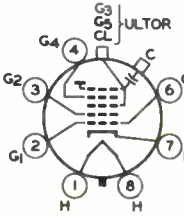
Optical:

Faceplate . . . . . .Filterglass
Light transmission (Approx.) 76%
Phosphor (For Curves, see front of this Section) . P4—Sulfide Type, Aluminized

Mechanical:

Operating Position . . . . . .Any
Weight (Approx.) . . . . . 20 lbs
Overall Length . . . . . 14-11/16" + 5/16" - 5/8"
Neck Length . . . . . 5-7/16" + 1/8" - 7/16"
Projected Area of Screen . . . . . 262 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 J171 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 Nonoeightar 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



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:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	154 max.	volts
Positive bias value	0 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 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with 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 400	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

21DLP4
PICTURE TUBE

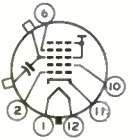
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc 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	2500 max. μμf; 2000 min. μμf
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	74%
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	90°
Horizontal	85°
Vertical	68°
Electron Gun	Type Requiring No Ion-Trap Magnet
Tube Dimensions:	
Overall length	17" ± 3/8"
Greatest width	20-1/4" ± 1/8"
Greatest height	16-3/8" ± 1/8"
Diagonal	21-3/8" ± 1/8"
Neck length	4-1/2" ± 3/16"
Screen Dimensions (Minimum):	
Greatest width	19-1/16"
Greatest height	15-1/16"
Diagonal	20-1/4"
Projected area	262 sq. in.
Weight (Approx.)	24 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Bulb	J171D2/E1
Base	Short Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-203), or Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-63)
Basing 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



Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

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21DLP4

PICTURE TUBE

GRID-DRIVE▲ SERVICE

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

Maximum and Minimum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	{20000 max. {12000● min.	volts volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	? 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	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c_3k}) between 12000 and 20000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus§	-50 to +400	volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*volts*
and grid-No.2 voltage of	*300*	*volts*
Grid-No.4 Voltage for focus	0 to 400	volts

▲,●,§,*: See next page.

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PICTURE TUBE

Grid-No.1 Voltage for visual extinction of focused raster	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	28 to 72	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:*

ULTOR-TO-GRID-No.1 VOLTAGE	{20000 max. {12000▲ min.	volts volts
GRID-No.4-TO-GRID-No.1 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	140 max.	volts
Negative-bias value	0 max.	volts
Negative-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.	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.1 voltage ($E_{c_3g_1}$) between 12000 and 20000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 225 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§	0 to 450	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	

▲ ◆ § ★ ■: See next page.

21DLP4

PICTURE TUBE

Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)..	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable 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.	28 to 60	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	−28 to −60	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 minimum* ultor- or ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 21DLP4 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 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-to-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.

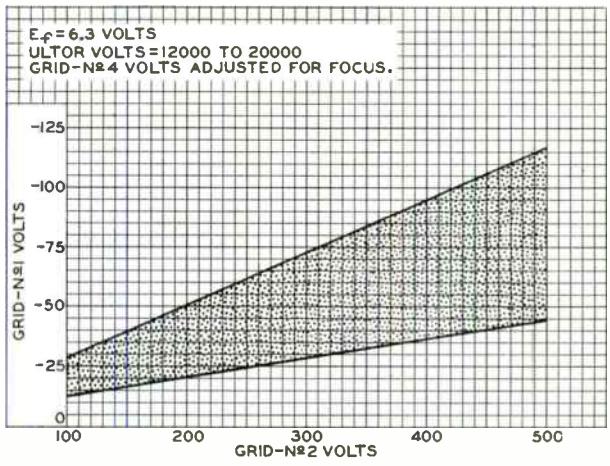
■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

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

21DLP4

RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



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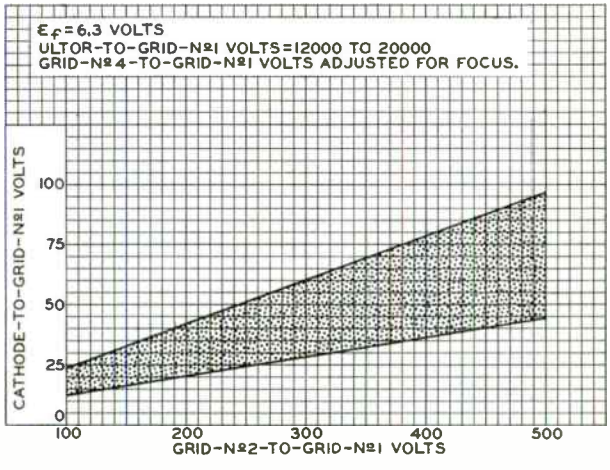
CATHODE-DRIVE SERVICE



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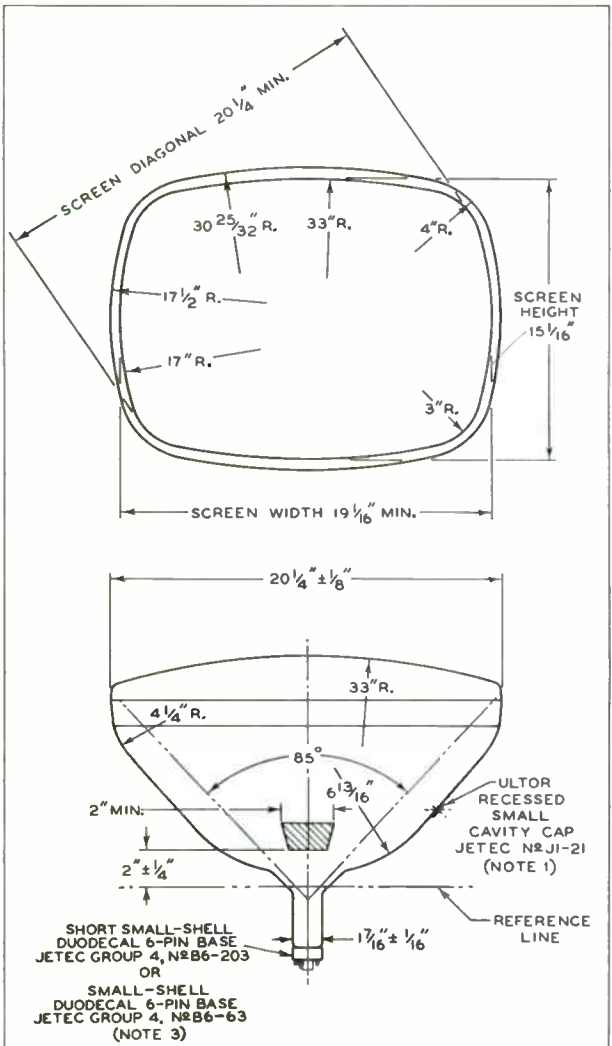
21DLP4

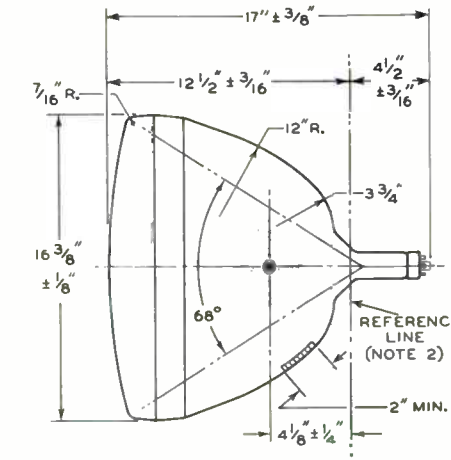
PICTURE TUBE

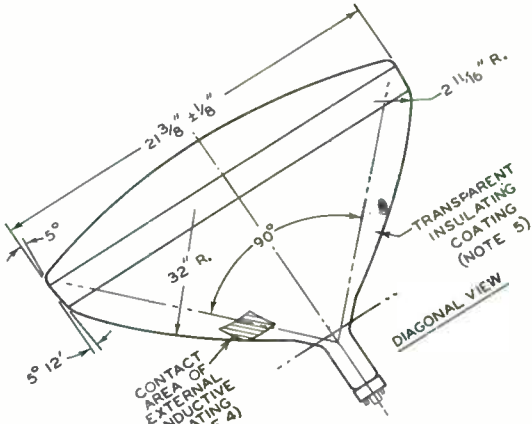


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON NEW JERSEY

21DLP4

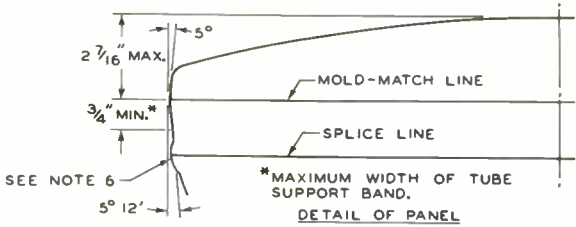
PICTURE TUBE





21DLP4

PICTURE TUBE



DETAIL OF PANEL

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 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 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".

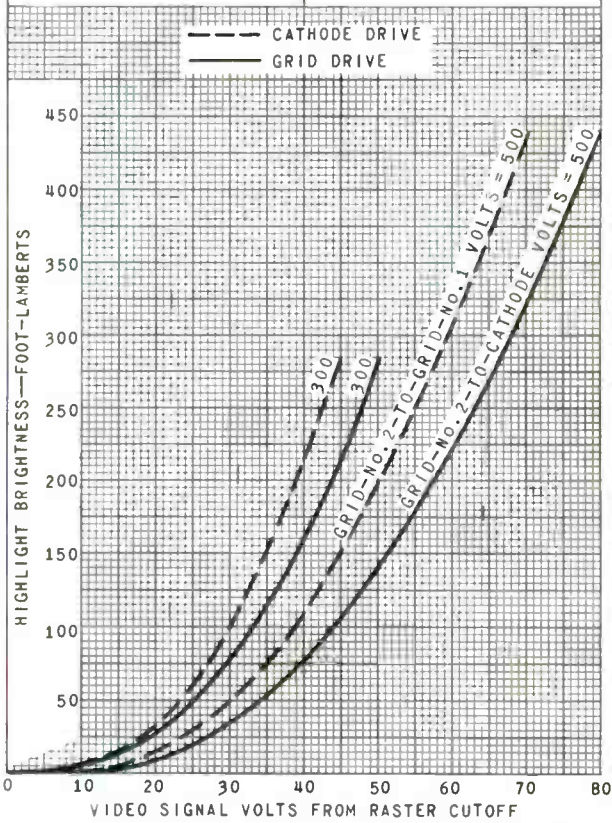
NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 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.

21DLP4
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-No.1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF.	GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 18"X13-1/2"	RASTER SIZE = 18"X13-1/2"



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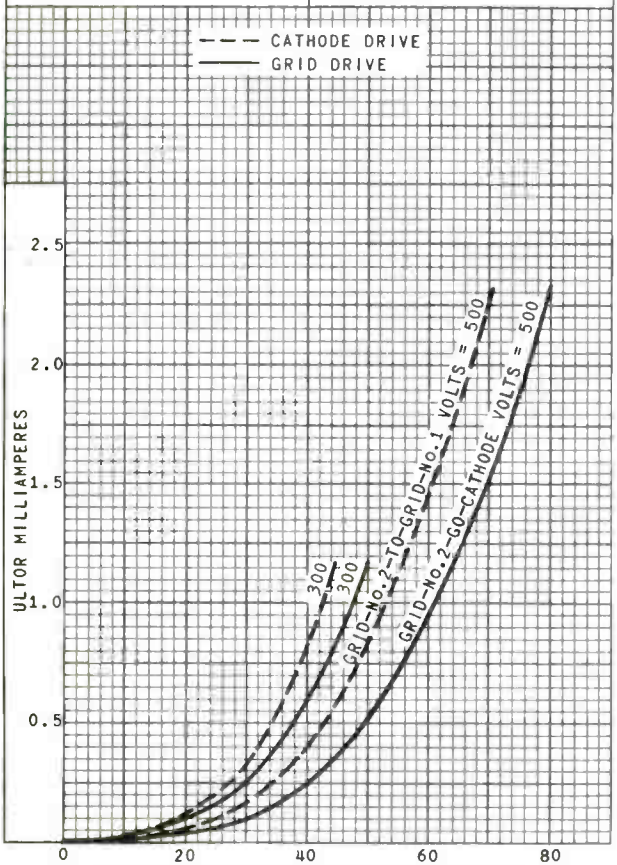
92CS-9143R1

21DLP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-NO.1 VOLTS = 12000 TO 20000	ULTOR VOLTS = 12000 TO 20000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID NO.1 TO GIVE FOCUSED RASTER CUTOFF.	GRID NO.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



ELECTRON TUBE DIVISION
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92CS-9351

21DSP4

PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION
LOW GRID-No.2 VOLTAGE — CATHODE-DRIVE TYPE

DATA

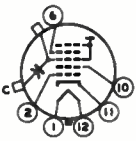
General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.6	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.	2500 max.	μμf
	2000 min.	μμf
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		74%
Phosphor (For Curves, see front of this Section)		P4—Sulfide Type Aluminized
Fluorescence		White
Phosphorescence		White
Persistence		Medium-Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		90°
Horizontal		85°
Vertical		68°
Electron Gun		Type Requiring No Ion-Trap Magnet
Tube Dimensions:		
Overall length		18" ± 3/8"
Greatest width		20-1/4" ± 1/8"
Greatest height		16-3/8" ± 1/8"
Diagonal		21-3/8" ± 1/8"
Neck length		5-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)		33"
Screen Dimensions (Minimum):		
Greatest width		19-1/16"
Greatest height		15-1/16"
Diagonal		20-1/4"
Projected area		262 sq. in.
Weight (Approx.)		24 lbs
Operating Position		Any
Cap		Recessed Small Cavity (JEDEC No.J1-21)
Bulb		J171 D2/E1
Base		Small-Shell Duodecal 6-Pin, Arrangement 1 (JEDEC Group 4, No.B6-63), or Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)

21DSP4
PICTURE TUBE

Basing 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



Cap - 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 max. / 12000# min.	volts / volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value.	1000 max.	volts
Negative value.	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE. . . .	64 max.	volts
GRID-No.2-TO-CATHODE 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:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	410 max.	volts
After equipment warm-up period. . .	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g1}) between 12000 and 20000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 40 and 64 volts

Grid-No.4-to-Grid-No. Voltage for focus§.	0 to 400 volts
Cathode-to-Grid-No.1 Voltage (Ek_{g1}) 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 (Peak negative)	Same value as determined for Ek_{g1} except video drive is a negative voltage

21DSP4

PICTURE TUBE

Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses
Examples of Use of Design Ranges:		
With ultor-to-grid-No.1 voltage of	*18000*	*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 350	volts
Cathode-to-Grid-No.1 Voltage♦ for visual extinction of focused raster	32 to 47	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	-32 to -47	volts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance	1.5 max.	megohms

■ 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.

50% 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 these items.

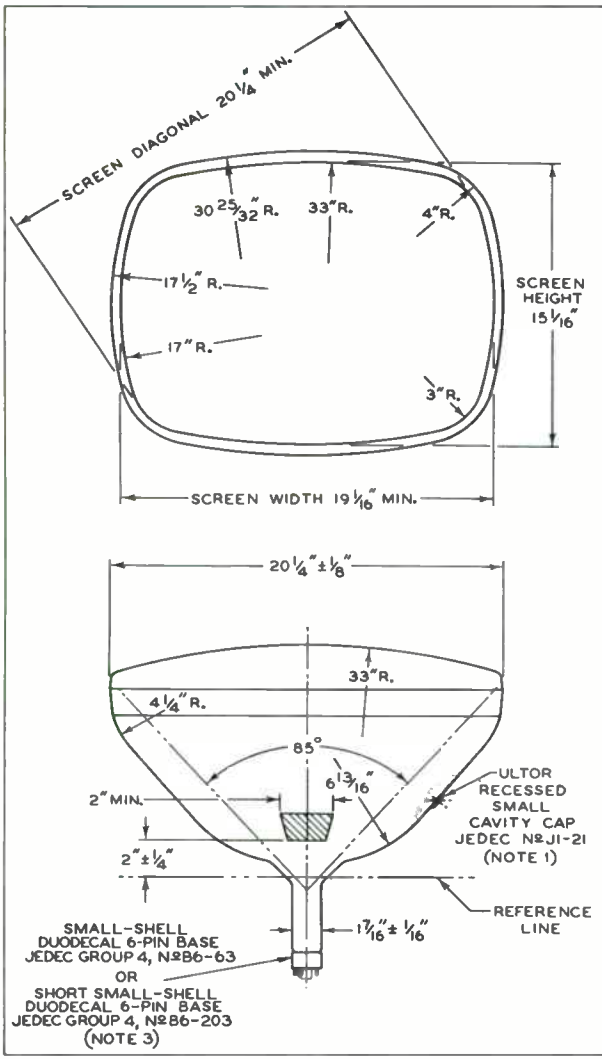
* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 7/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

♦ The cathode-to-grid-No.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-No.1 voltage and will decrease by approximately 2 per cent for every 1000-volt decrease in ultor-to-grid-No.1 voltage.

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

21DSP4

PICTURE TUBE



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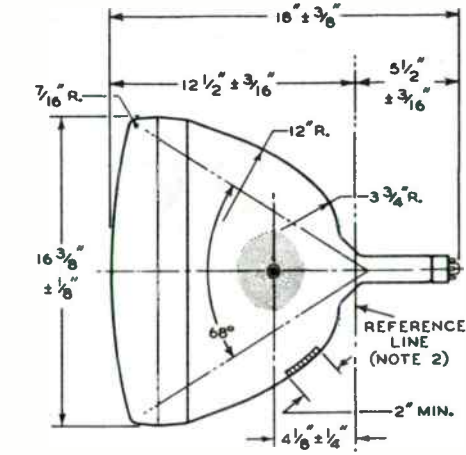
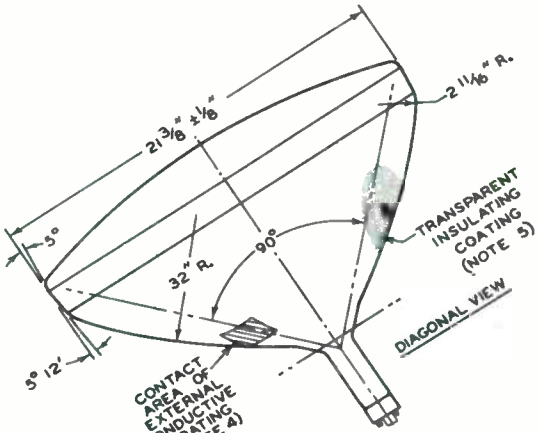
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21DSP4

PICTURE TUBE





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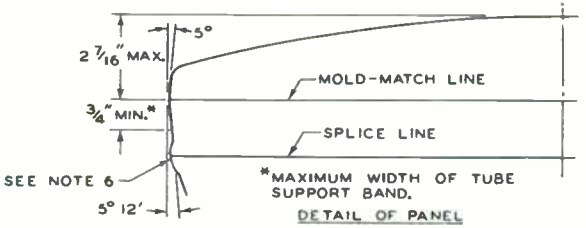
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21DSP4

PICTURE TUBE



DETAIL OF PANEL

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 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.

NOTE 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.

ELECTRON TUBE DIVISION
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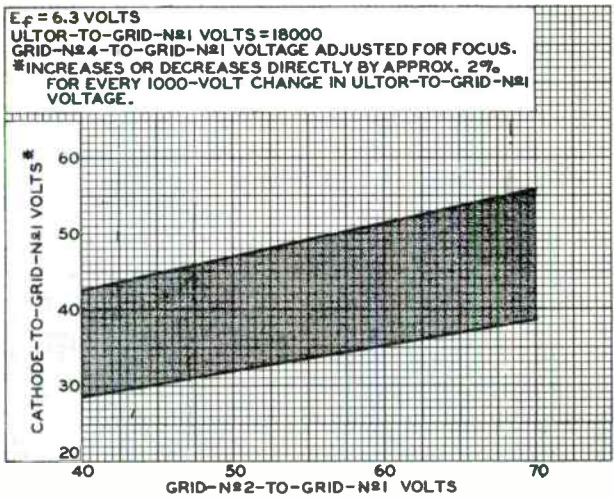
21DSP4

RASTER-CUTOFF-RANGE CHART

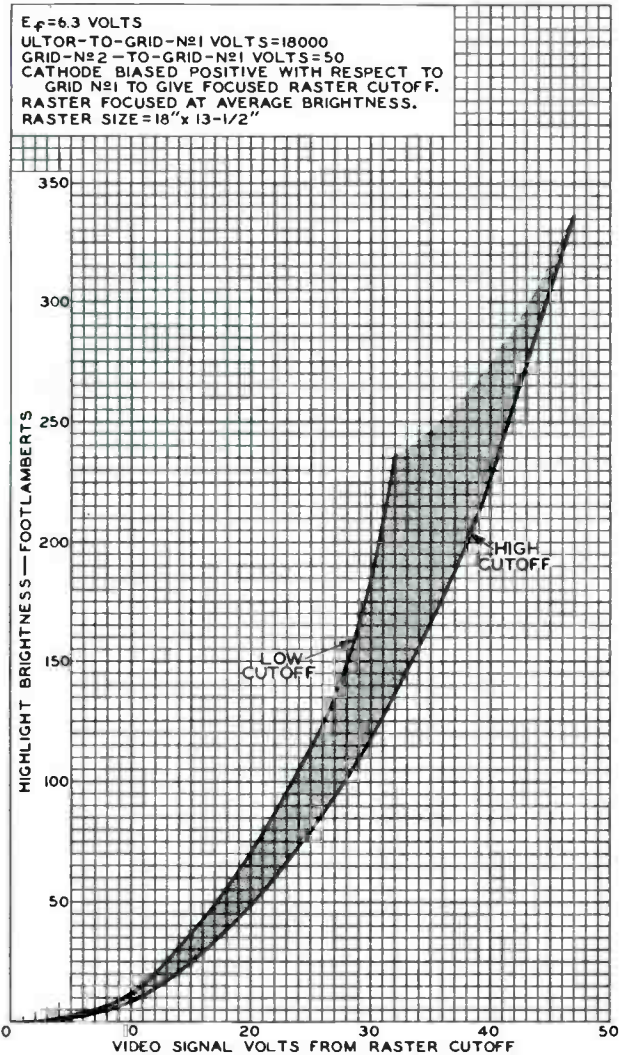


92CS-9911

RCA

21DSP4

CATHODE-DRIVE CHARACTERISTICS



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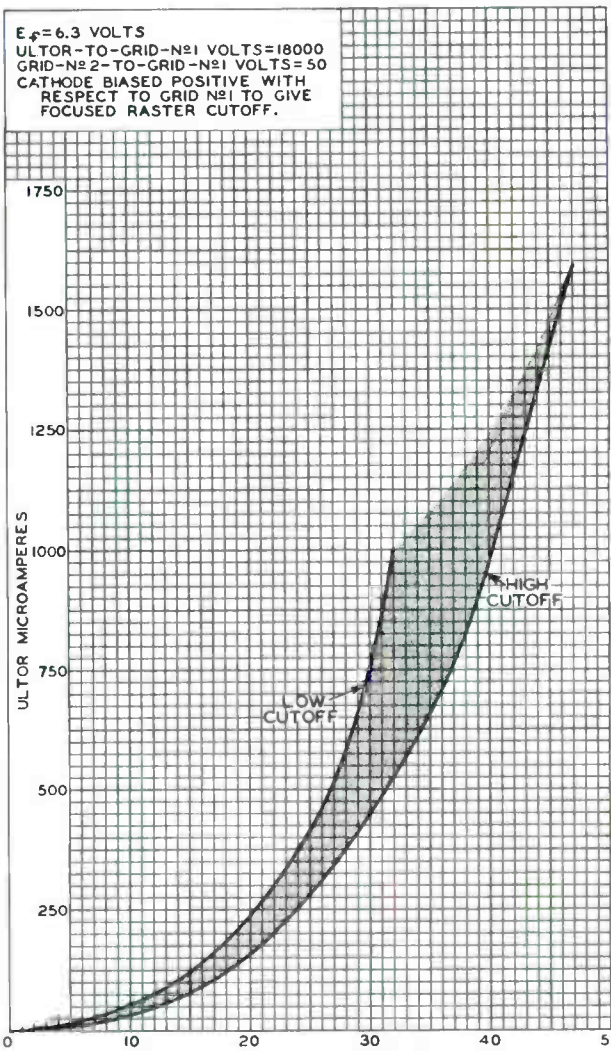
92CM-9904

RCA

21DSP4

CATHODE-DRIVE CHARACTERISTICS



RCA

21EAP4

PICTURE TABLE

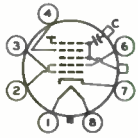
SHORT RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

With heater having controlled warm-up time

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	2.35 ± 10%	volts
Current at 2.35 volts	0.6	amp
Warm-up time (Average)	11	sec
Capacitance between External Conductive Coating and Ultor	2000 max. 1500 min.	μμf μμf
Faceplate, Spherical		Filterglass
Phosphor (For Curves, see front of this Section)		P4—Sulfide Type Aluminized
Deflection Angles (Approx.):		
Diagonal		110°
Horizontal		105°
Vertical		87°
Electron Gun		Type Requiring No Ion-Trap Magnet
Tube Dimensions:		
Overall length		12-15/16" ± 1/4"
Greatest width		20-1/4" ± 1/8"
Greatest height		16-3/8" ± 1/8"
Diagonal		21-3/8" ± 1/8"
Neck length		3-11/16" ± 1/16"
Radius of curvature of faceplate (External surface)		28-1/2"
Screen Dimensions (Minimum):		
Greatest width		19-1/16"
Greatest height		15-1/16"
Diagonal		20-1/4"
Projected area		262 sq. in.
Operating Position		Any
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		8JK



Pin 1 - Heater
Pin 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

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	850 max.	volts
Negative value	630 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts

21EAP4
PICTURE TUBE

GRID-No.1 VOLTAGE:		
Negative-peak value	360 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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

21EP4-A, 21EP4-B
PICTURE TUBES

RECTANGULAR GLASS TYPES

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 ± 10% . . . . . amp

Capacitance between External Conductive Coating and Ultor . . . . . {750 max. µµf; 500 min. µµf}

Faceplate, Cylindrical . . . . . Filterglass

Phosphor (For Curves, see front of this Section)	*Type 21EP4-A*	*Type 21EP4-B*
	P4—Sulfide Type	P4—Sulfide Type Aluminized

Deflection Angles (Approx.):
- Diagonal . . . . . 70°
- Horizontal . . . . . 65°
- Vertical . . . . . 50°

Electron Gun . . . . . Ion-Trap Type Requiring External Single-Field Magnet

Tube Dimensions:
- Overall length . . . . . 23" ± 3/8"
- Greatest width . . . . . 20-1/4" ± 1/8"
- Greatest height . . . . . 15-9/16" ± 1/8"
- Diagonal . . . . . 21-7/32" ± 1/8"
- Neck length . . . . . 7-15/32" ± 3/16"
- Radius of curvature of faceplate (External horizontal surface) . . . . . 35"

Screen Dimensions (Minimum):
- Greatest width . . . . . 19-1/8"
- Greatest height . . . . . 13-7/8"
- Diagonal . . . . . 20-1/16"
- Projected area . . . . . 238 sq. in.

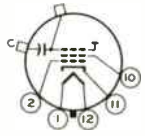
Operating Position . . . . . Any

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

Base . . Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57) ←

Basing Designation for BOTTOM VIEW 12N

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



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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts

← Indicates a change.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21EP4-A, 21EP4-B

PICTURE TUBES

GRID-No.1 VOLTAGE:		
Negative-bias value.	125 max.	volts
Positive-bias value.	0 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 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

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

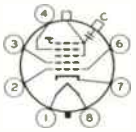
General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current at 6.3 volts	0.6	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	{2500 max. {2000 min.	μμf μμf
Faceplate, Spherical	Filterglass	
Light transmission (Approx.)	74%	
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized	
Fluorescence	White	
Phosphorescence	White	
Persistence	Medium Short	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	110°	
Horizontal	105°	
Vertical	87°	
Electron Gun	Type Requiring No Ion-Trap Magnet	
Tube Dimensions:		
Overall length	13-3/8" ± 5/16"	
Greatest width	20-1/4" ± 1/8"	
Greatest height	16-3/8" ± 1/8"	
Diagonal	21-3/8" ± 1/8"	
Neck length	4-3/8" ± 1/8"	
Radius of curvature of faceplate (External surface)	33"	
Screen Dimensions (Minimum):		
Greatest width	19-1/16"	
Greatest height	15-1/16"	
Diagonal	20-1/4"	
Projected area	262 sq. in.	
Weight (Approx.)	23 lbs	
Operating Position	Any	
Cap	Recessed Small Cavity (JEDEC No.J1-21)	
Bulb	J171 H1/J1	
Socket	Ucinite Part No.115446, or equivalent	
Base	Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)	

21EMP4

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



Cap – Ultor (Grid 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-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
	12000* min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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 voltage (E_{c_5k}) between 12000 and 18000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts*

Grid-No.4 Voltage for focus§	0 to 400 volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	See *Raster-Cutoff-Range Chart for Grid-Drive Service*
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage
Grid-No.4 Current	−25 to +25 μa
Grid-No.2 Current	−15 to +15 μa
Field Strength of Adjustable Centering Magnet*	0 to 8 gausses

Examples of Use of Design Ranges:

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 raster	−35 to −75	volts
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	35 to 75	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:*

ULTOR-TO-GRID-No.1 VOLTAGE	18000	max.	volts
	12000■	min.	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	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	140	max.	volts
Negative-bias value	0	max.	volts
Negative-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.	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.1 voltage (E_{c5g_1}) between 12000■ and 18000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g_1}) between 225 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	

Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gauss

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	34 to 63	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	-34 to -63	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-minimum* ultor (or ultor-to-grid-No.1) voltage is 11,000 volts, below which the serviceability of the 21EMP4 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.4-to-grid-No.1) voltage required for optimum focus of any individual tube will have a value between 0 and 400 volts 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.

* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/8". 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.

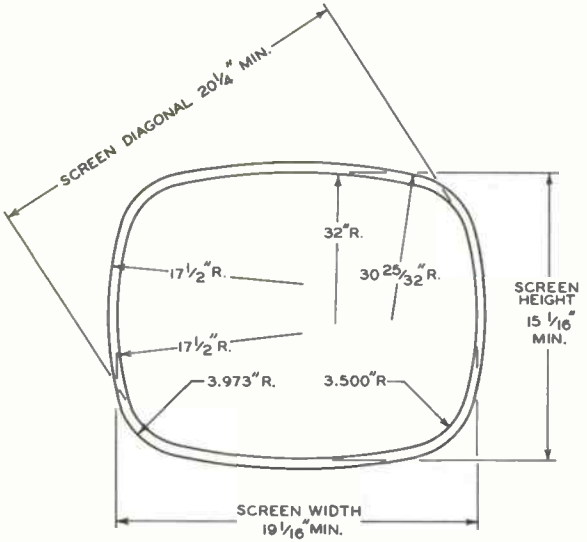
■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

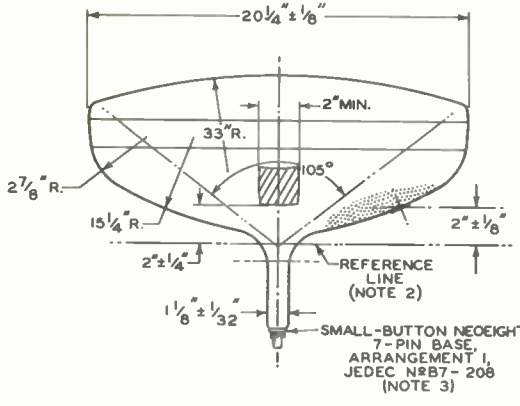
OPERATING CONSIDERATIONS

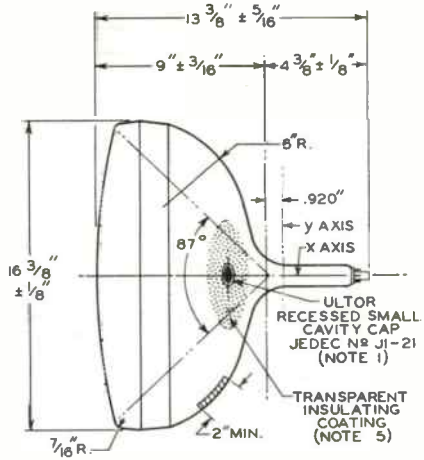
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 21EMP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

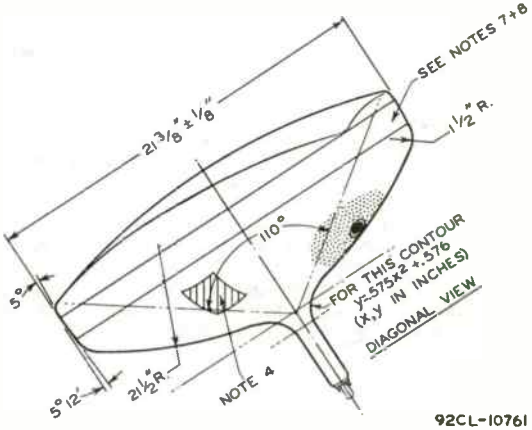
For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section

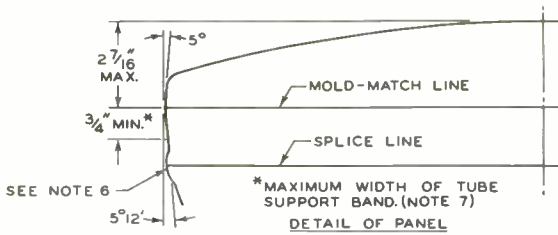
21EMP4











DETAIL OF PANEL

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 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.

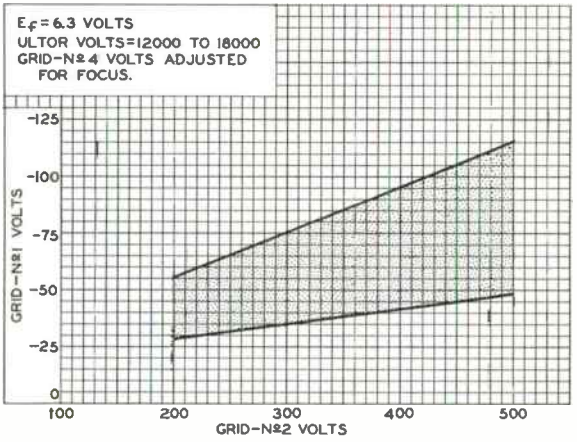
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE OF 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: WIDTH OF UNDISTURBED REGION BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

NOTE 8: TUBE MOUNTING OR YOKE SUPPORT CLAMPS MUST BE SPACED FROM TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

RASTER-CUTOFF-RANGE CHARTS
Grid-Drive Service



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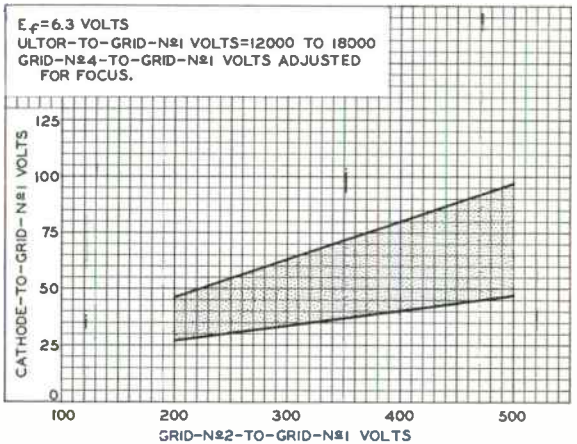
Cathode-Drive Service



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21EP4C

Picture Tube

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
70° MAGNETIC DEFLECTION

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	750 max. 500 min.	pf pf
Heater Current at 6.3 volts	600 ± 60	ma
Electron Gun	Type Requiring No Ion Trap Magnet	

Optical:

Phosphor (For Curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate, Cylindrical	Filterglass
Light transmission (Approx.)	74%

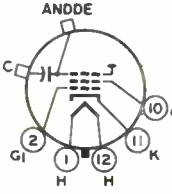
Mechanical:

Weight (Approx.)	29 lbs
Overall Length	23-1/32" ± 3/8"
Neck Length	7-1/2" ± 3/16"
Projected Area of Screen	248 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 J170 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.B5-57)
Basing Designation for BOTTOM VIEW	12N

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



Cao – 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	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode:		
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	12000	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

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PICTURE TUBE

SHORT 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 . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 . . . . . amp
- Warm-up time (Average) . 11 . . . . . sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of Receiving Tube Section.

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . . 6 μμf
- Cathode to all other electrodes . . . . . 5 μμf
- External conductive coating to ultor . . {2500 max. μμf / 2000 min. μμf

Faceplate, Spherical . . . . . Filterglass
- Light transmission (Approx.) 73%

Phosphor (For Curves, see front of this Section) . P4—Sulfide Type Aluminized
- Fluorescence . . . . . White
- Phosphorescence . . . . . White
- Persistence . . . . . Short

Focusing Method . . . . . Electrostatic
Deflection Method . . . . . Magnetic
Deflection Angles (Approx.):
- Diagonal . . . . . 110°
- Horizontal . . . . . 105°
- Vertical . . . . . 87°

Electron Gun . . . . . Type Requiring No Ion-Trap Magnet
Tube Dimensions:
- Overall length . . . . . 12-9/16" ± 5/16"
- Greatest width . . . . . 20-1/4" ± 1/8"
- Greatest height . . . . . 16-3/8" ± 1/8"
- Diagonal . . . . . 21-3/8" ± 1/8"
- Neck length . . . . . 3-9/16" ± 1/8"

Screen Dimensions (Minimum):
- Greatest width . . . . . 19-1/16"
- Greatest height . . . . . 15-1/16"
- Diagonal . . . . . 20-1/4"
- Projected area . . . . . 262 sq. in.

Weight (Approx.) . . . . . 23 lbs
Operating Position . . . . . Any
Cap . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Bulb J171 H1/J1
Socket . . . . . Ucinite Part No.115446, or equivalent
Base . . . . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)

RCA

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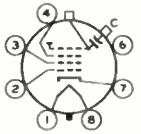
Basing Designation for BOTTOM VIEW. 8JR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.3
Pin 6 - Internal Connection—Do Not Use
Pin 7 - Cathode



Pin 8 - Heater
Cap - Ultor (Grid No.4, Collector)
C - External Conductive Coating

GRID-DRIVE[A] SERVICE

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

Maximum and Minimum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
	12000* min.	volts
GRID-No.3 VOLTAGE	650 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
	300 min.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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 voltage (E_{c_4k}) between 12000 and 18000 volts and grid-No.2 voltage (E_{c_2k}) between 400 and 550 volts

Grid-No.3 Voltage for focus§	0 to 400	volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.3 Current	-25 to +25	μa

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PICTURE TUBE

Grid-No.2 Current	-15 to +15		μa
Field Strengtn of Adjustable Centering Magnet♦	0 to 10		gausses

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*18000*	*volts*
and grid-No.2 voltage of	*400*	*500*	*volts*
Grid-No.3 Voltage for focus	0 to 400	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster	-34 to -63	-43 to -78	volts
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	34 to 63	43 to 78	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:*

ULTOR-TO-GRID-No.1 VOLTAGE	18000	max.	volts
	12000●	min.	volts
GRID-No.3-TO-GRID-No.1 VOLTAGE	650	max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	690	max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	550	max.	volts
	300	min.	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:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds	410	max.	volts
After equipment warm-up period	180	max.	volts
Heater positive with respect to cathode	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_4g_1}$) between 12000 and 18000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 400 and 690 volts

Grid-No.3-to-Grid-No.1 Voltage for focus§	0 to 400	volts

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PICTURE TUBE

Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster.	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*		
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage		
Grid-No.3 Current	-25 to +25		μa
Grid-No.2 Current	-15 to +15		μa
Field Strength of Adjustable Centering Magnet▲. . .	0 to 10		gauss
Examples of Use of Design Ranges:			
With ultor-to-grid-No.1 voltage of	*16000*	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*400*	*500*	*volts*
Grid-No.3-to-Grid-No.1 Voltage for focus	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster.	34 to 56	41 to 69	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	-34 to -56	-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 minimum* ultor- or ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 21EQP4 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-microampere change in ultor current. Because the 21EQP4 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

21EQP4

PICTURE TUBE

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.

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 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 21EQP4 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

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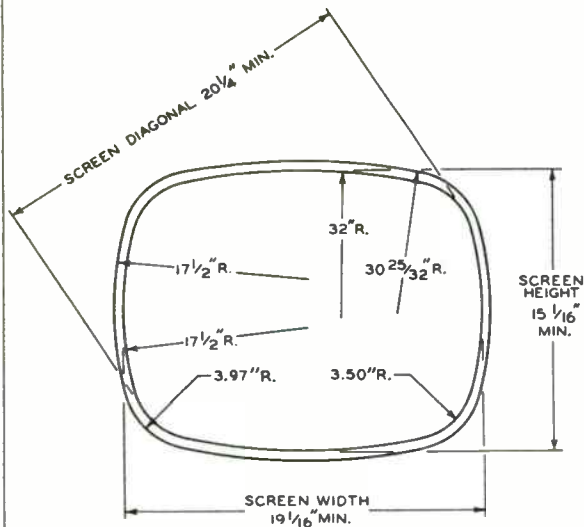
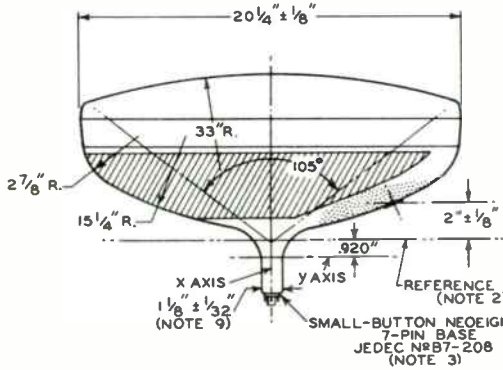
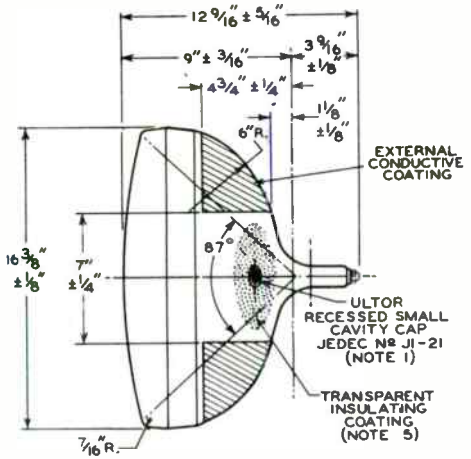


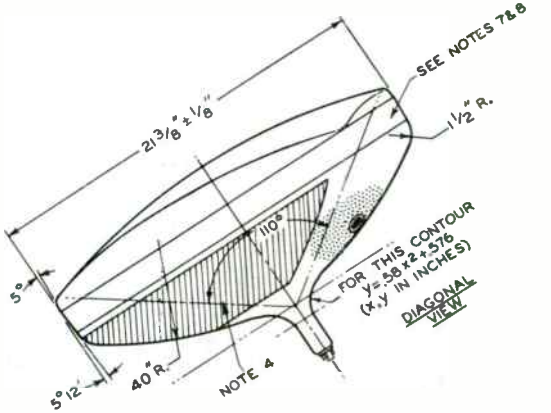


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21EQP4

PICTURE TUBE



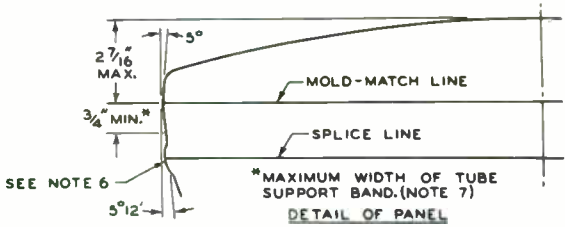


92CL-9936R1

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

21EQP4

PICTURE TUBE



DETAIL OF PANEL

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 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, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 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.

NOTE 7: WIDTH OF UNDISTURBED REGION BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

NOTE 8: TUBE MOUNTING OR YOKE SUPPORT CLAMPS MUST BE SPACED FROM TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

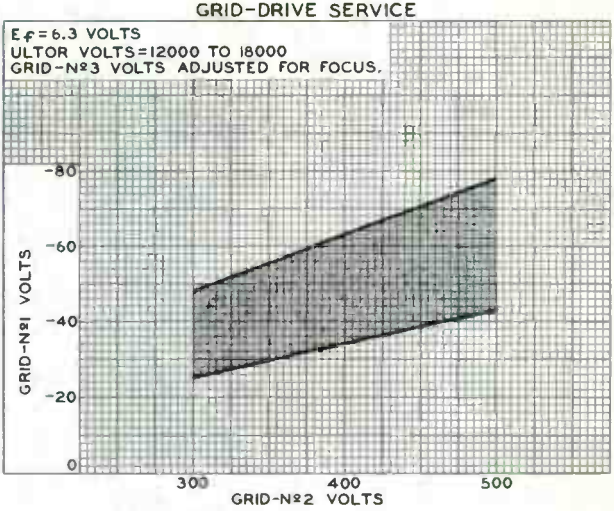
NOTE 9: NECK DIAMETER IS MAINTAINED TO AT LEAST 2-7/16" FROM REFERENCE LINE.

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

21EQP4

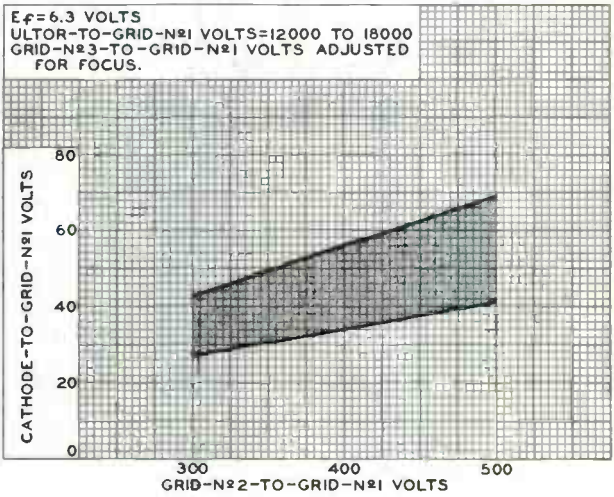
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



92CS-9933

CATHODE-DRIVE SERVICE



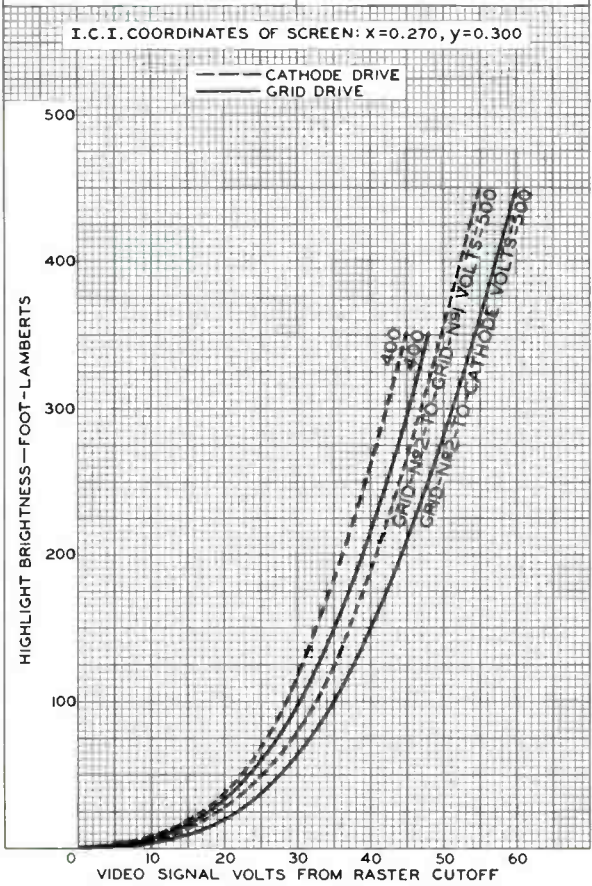
92CS-9934

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

21EQP4

AVERAGE DRIVE CHARACTERISTICS

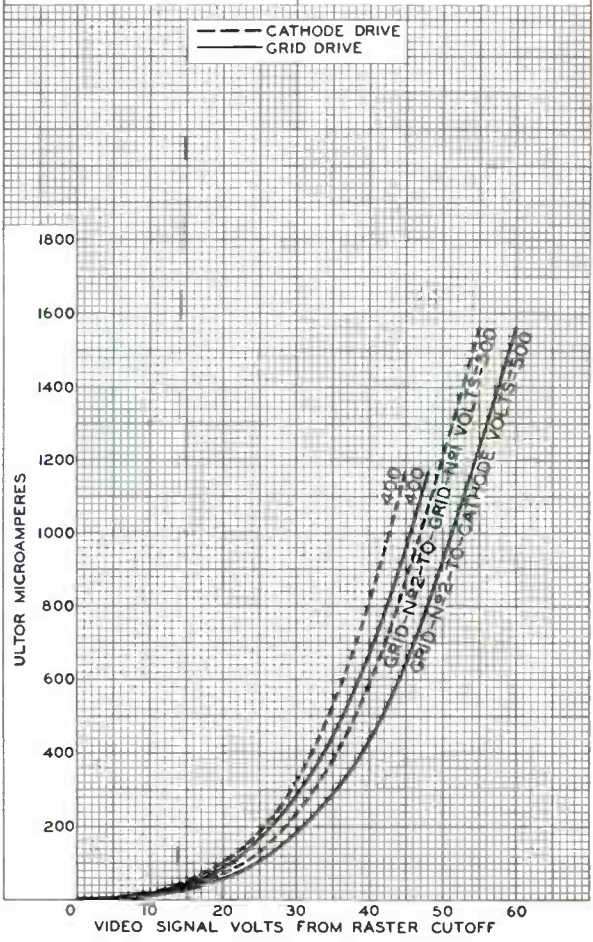
CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 18"x 13½"	RASTER SIZE = 18"x 13½"



2IEQP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS=12000 TO 18000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 6.3 VOLTS ULTOR VOLTS=12000 TO 18000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



Picture Tube

SHORT RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° MAGNETIC DEFLECTION**
INTERNAL MAGNETIC SHIELD

With Heater Having Controlled Warm-Up Time

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	2000 max. / 1500 min.	pf
Heater Current at 2.68 volts	450 ± 45	ma
Heater Warm-Up Time (Average)	11	seconds

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

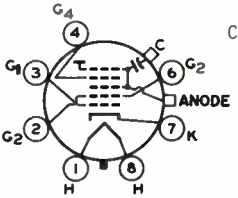
Optical:

Phosphor (For Curves, see front of this Section) . P4—Sulfide Type, Aluminized
Faceplate, Spherical. . . . . Filterglass
Light transmission (Approx.). 75.5%

Mechanical:

Weight (Approx.). . . . . 20 lbs
Overall Length. . . . . 12-15/16" ± 1/4"
Neck Length . . . . . 3-11/16" ± 1/16"
Projected Area of Screen. . . . . 262 sq. in.
External Conductive Coating:
Type. . . . . .Regular-Band
Contact area for grounding. . . . . Near Referece Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J171 G/H* sheets 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. 8JK

Pin 1 – Heater
Pin 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



Cap – Anode (Grid No.3, Grid No.5, Screen, Collector)
C – External Conductive Coating

21EVP4

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	950 max.	volts
Negative value	700 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
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	2.9 max. 2.4 min.	volts 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	16000	volts
Grid-No.4 Voltage	100 to 500	volts
Grid-No.2 Voltage	300	volts
Grid-No.1 Voltage for visual extinction of focused raster	-35 to -72	volts

Maximum Circuit Value:

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

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 — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **72° MAGNETIC DEFLECTION**

Electrical:

Direct Interelectrode Capacitances:		
Cathode to all other electrodes	5	pf
Grid No.1 to all other electrodes	6.5	pf
External conductive coating to anode	1500 max.	pf
	1200 min.	pf
Heater Current at 6.3 volts	600 ±60	ma
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For Curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	75.5%

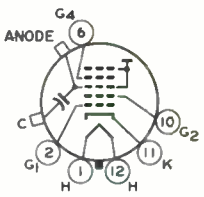
Mechanical:

Weight (Approx.)	24 lbs
Overall Length	23.031" ± .375"
Neck Length	7.500" ± .188"
Projected Area of Screen	262 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 J171 B/F* sheets at front of this Section

Cap. . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . . . . Small-Shell Duodecal 6-Pin, Arrangement 1, (JEDEC No.B6-63)
Basing 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
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	22000 max.	volts
	12000 min.	volts

Grid-No.4 (Focusing) Voltage:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
Grid-No.2 Voltage	700 max.	volts
Grid-No.1 Voltage:		
Negative peak value	220 max.	volts
Negative bias value	180 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
Heater Voltage	6.9 max. 5.7 min.	volts 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	18000	volts
Grid-No.4 Voltage	0 to +400	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

Picture Tube

SHORT RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 5%	ma
Heater Warm-Up Time (Average)	11	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	2500 max. / 2000 min.	μμf

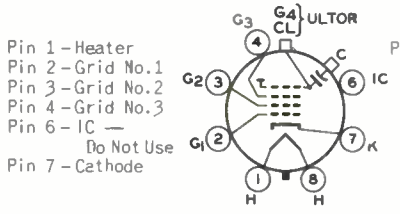
Electron Gun . . . . . Type Requiring No Ion-Trap Magnet

Optical:

Faceplate . . . . . Filterglass
Light transmission (Approx.) 76%
Phosphor (For Curves, see front of this Section) . . P4—Sulfide Type, Aluminized

Mechanical:

Operating Position . . . . . Any
Weight (Approx.) . . . . . 20 lbs
Overall Length . . . . . 12-13/16" ± 5/16"
Neck Length . . . . . 3-9/16" ± 1/8"
Projected Area of Screen . . . . . 262 sq. in.
External Conductive Coating:
Type . . . . . Modified Band
Contact area for grounding . . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines* and *Bulb J171 G/K* 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)
Basing Designation for BOTTOM VIEW 8JR



Pin 1 – Heater
Pin 2 – Grid No.1
Pin 3 – Grid No.2
Pin 4 – Grid No.3
Pin 6 – IC — Do Not Use
Pin 7 – Cathode
Pin 8 – Heater
Cap – Ultor (Grid No.4, Collector)
C – External Conductive Coating

21FAP4

Maximum Ratings, *Design-Maximum Values:*

ULTOR VOLTAGE	22000 max.	volts
GRID-No.3 (FOCUSING) VOLTAGE:		
Positive value	700 max.	volts
GRID-No.2 VOLTAGE	600 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	154 max.	volts
Positive bias value	0 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 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor voltage of	*16000*	*volts*
and grid-No.2 voltage of	*500*	*volts*
Grid-No.3 Voltage for focus	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster	-43 to -78	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

21FDP4

Picture Tube

SHORT RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 5%	ma
Heater Warm-Up Time (Average)	11	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	2000 max. / 1500 min.	μμf
Electron Gun	Type Requiring No Ion-Trap Magnet	

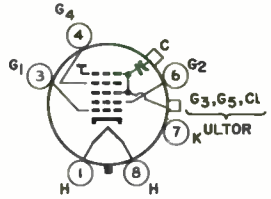
Optical:

Faceplate . . . . . Filterglass
Light transmission (Approx.) 76%
Phosphor (For Curves, see front of this Section) . P4—Sulfide Type, Aluminized

Mechanical:

Operating Position . . . . . Any
Weight (Approx.) . . . . . 20 lbs
Overall Length . . . . . 13-1/8" ± 1/4"
Neck Length . . . . . 3-7/8" ± 1/16"
Projected Area of Screen . . . . . 262 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 J171 G/K* 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)
Basing Designation for BOTTOM VIEW . . . . . BKW

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



21FDP4

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 peak value	400 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 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 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with 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	+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

21FKP22

Color Picture Tube

INTEGRAL PROTECTIVE WINDOW

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

ALL-GLASS ENVELOPE
MAGNETIC CONVERGENCE

ELECTROSTATIC FOCUS
MAGNETIC DEFLECTION

For Use in Color-TV Receivers

The 21FKP22 is the same as the 21FJP22 except that the surface of the protective window for the 21FKP22 has not been treated to reduce specular reflection.

Picture Tube

LOW-VOLTAGE ELECTROSTATIC FOCUS
NO ION-TRAP MAGNET REQUIRED — ALUMINIZED SCREEN
RECTANGULAR GLASS TYPE — 110° MAGNETIC DEFLECTION
Low-Grid-No.2-Voltage—for Cathode-Drive Operation

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. 2000 min.	pf pf
Heater Current at 6.3 volts.	600 ± 30	ma
Heater Warm-Up Time (Average).	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For curves, see front of this Section) .	P4—Sulfide Type, Aluminized
Faceplate.	Filterglass
Light Transmission (Approx.)	75%

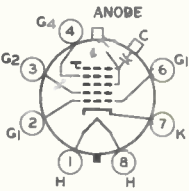
Mechanical:

Weight (Approx.)	25 lbs
Overall length	14.875" ± .281"
Neck length.	5.125" ± .125"
Projected Area of Screen	282 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 J187 E* 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) or (JEDEC No. B7-237)
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
Cap – Anode (Grid No.3, Grid No.5, Screen, Collector)
C – External Conductive Coating



23DBP4

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

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

Anode Voltage	22000 max.	volts
	15000 min.	volts
Grid-No.4 (Focusing) Voltage:		
Positive value	1250 max.	volts
Negative value	400 max.	volts
Grid-No.2 Voltage	250 max.	volts
Grid-No.2 to Cathode Voltage	100 max.	volts
	40 min.	volts
Cathode Voltage:		
Positive peak value	220 max.	volts
Positive bias value	155 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
Heater Voltage	6.9 max.	volts
	5.7 min.	volts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	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

Anode Voltage	18000	volts
Grid-No.4 Voltage	250	volts
Grid-No.2 Voltage	50	volts
Cathode Voltage for visual extinction of focused raster	34 to 52	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 on this Section

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 — **92° MAGNETIC DEFLECTION**
NO ION-TRAP MAGNET REQUIRED

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[a] .	2500 max.	pf
	1700 min.	pf
Heater Current at 6.3 volts.	450 ± 20	ma
Heater Warm-Up Time (Average).	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

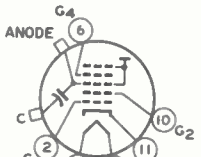
Optical:

Phosphor (For Curves, see front of this Section) . P4—Sulfide Type, Aluminized
Faceplate. . . . . Filterglass
Light transmission at center (Approx.) 42%

Mechanical:

Weight (Approx.) . . . . . 29 lbs
Overall Length . . . . . 18.000" ± .375"
Neck Length. . . . . 5.500" ± .188"
Projected Area of Screen . . . . . 282 sq. in.
External Conductive Coating:
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 J-87 J* sheets at the front of this section.
Cap. . . . . Recessed Small Cavity (JEDEC No. J1-21)
Base . . . . . Short Small-Shell Duodecal 6-Pin, (JEDEC Group 4, No. B6-203)
Basing 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



Cap – Anode, (Grid No.3, Grid No.5, Screen, Collector)
C – External Conductive Coating

23EKP4

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

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

Anode Voltage	25000 max.	volts
	11000 min.	volts
Grid-No.4 Voltage:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
Grid-No.2 Voltage	550 max.	volts
	200 min.	volts
Grid-No.1 Voltage:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
Heater Voltage	6.9 max.	volts
	5.7 min.	volts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	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

Anode Voltage	20000	volts
Grid-No.4 Voltage[b]	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

[a] Includes implosion protection hardware.

[b] 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 RCA-2F21 monoscope, or equivalent.

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

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 — **92° MAGNETIC DEFLECTION**
NO ION-TRAP MAGNET REQUIRED

Low-Grid-No.2-Voltage—for Cathode-Drive Operation

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[a]	2500 max. / 1700 min.	pf
Heater Current at 6.3 volts	600 ±30	ma
Heater Warm-up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For Curve, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate	Filterglass
Light transmission at center (Approx.)	42%

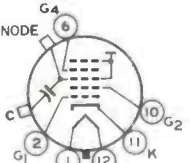
Mechanical:

Weight (Approx.)	29 lbs
Overall Length	18.125" ± .375"
Neck Length	5.625" ± .125"
Projected Area of Screen	282 sq. in.
External Conductive Coating:	
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 J187 J* sheets at the front of this section.

Cap	Recessed Small Cavity (JEDEC No.J1-21)
Base	Short Small-Shell Duodecal 6-Pin, (JEDEC Group 4, No. 96-203)
Basing 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



Cap – Anode (Grid No.3, Grid No.5, Screen, Collector)
C – External Conductive Coating

23ENP4

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

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

Anode Voltage	25000 max.	volts
	11000 min.	volts
Grid-No.4 Voltage:		
Positive value	1250 max.	volts
Negative value	400 max.	volts
Grid-No.2 Voltage	70 max.	volts
	40 min.	volts
Cathode Voltage:		
Negative peak value	2 max.	volts
Negative bias value	0 max.	volts
Positive bias value	100 max.	volts
Positive peak value	150 max.	volts
Heater Voltage	6.9 max.	volts
	5.7 min.	volts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	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

Anode Voltage	20000	volts
Grid-No.4 Voltage[b]	200	volts
Grid-No.2 Voltage	50	volts
Cathode Voltage for visual extinction of focused raster	36 to 54	volts
Field Strength of required adjustable Centering Magnet	0 to 12	gauss

Maximum Circuit Value:

Grid-No.1 Circuit Resistance	1.5 max.	megohms

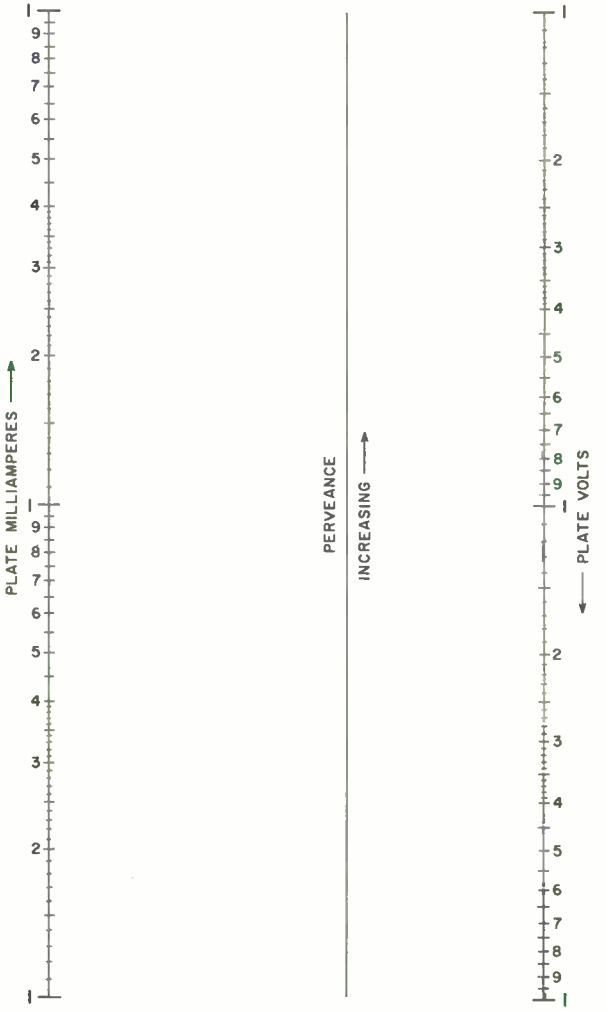
[a] Includes implosion protection hardware.

[b] 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 RCA-2F21 monoscope, or equivalent.

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

AVERAGE PLATE-CHARACTERISTIC NOMOGRAPH

For Diodes and Rectifiers



92CM-11244

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

Diode Nomograph

The Diode Nomograph on the preceding page may be used to determine for a diode unit (1) tube voltage drop for any plate current, or (2) plate current for any plate voltage when values for a single plate-voltage, plate-current condition are available from the published data. The nomograph may also be used to compare the perveance ($G = I_b/E_b^{\frac{3}{2}}$) of several diodes.

For convenience, PLATE VOLTS and PLATE MILLIAMPERES are plotted on two-decade logarithmic scales with the PERVEANCE line located between them.

To determine for a specific diode unit the desired tube voltage drop or plate current:

1. Obtain the plate-voltage, plate-current condition from the published data for the type.
2. Select convenient values for the decade scales for PLATE VOLTS and PLATE MILLIAMPERES.
3. Locate and connect with a straightedge the points for PLATE VOLTS and PLATE MILLIAMPERES obtained from the data.
4. Mark the intersection of the straightedge and the PERVEANCE line.
5. With this intersection as a pivot point, line up the straightedge with the desired value of PLATE VOLTS or PLATE MILLIAMPERES, and read the corresponding value of tube voltage drop or plate current on the appropriate scale.

Because the pivot point for a specific diode unit represents its perveance, the pivot points for several units (plotted to the same scales) indicate their relative perveance.

EXAMPLE

The published data for type 5U4GB gives a tube voltage drop (Per plate) of 44 volts at plate ma. = 225.

1. To determine the tube voltage drop at plate ma. = 100:
   a. On the nomograph, establish the decade scale for PLATE VOLTS as 1, 10, 100 (reading down) and the scale for PLATE MILLIAMPERES as 10, 100, 1000 (reading up).
   b. Locate and connect the points "PLATE VOLTS = 44" and "PLATE MILLIAMPERES = 225" with a straightedge.
   c. Mark the intersection of the straightedge and the PERVEANCE line.
   d. Pivot the straightedge about this intersection, line it up with the point "PLATE MILLIAMPERES = 100", and read "PLATE VOLTS = 25"—the tube voltage drop (Per plate).
2. To determine the plate current at plate volts = 33:
   a. Use the same pivot point on the PERVEANCE line as in "1d" above, line up the straightedge with the point "PLATE VOLTS = 33", and read "PLATE MILLIAMPERES = 150".

LIMITATIONS

For readings in the order of 1 volt and/or 1 milliampere or less, the nomograph is not accurate because of the effects of contact potential and initial electron velocity.

RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.

21MP4
PICTURE TUBE

RECTANGULAR METAL-SHELL TYPE

LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 ± 10% . . . . . amp ←

Faceplate, Spherical . . . . . Frosted Filterglass
Phosphor (For Curves, see front of this Section) . P4—Sulfide Type
Deflection Angles (Approx.):
- Diagonal . . . . . 70°
- Horizontal . . . . . 66°
- Vertical . . . . . 50°

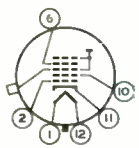
Electron Gun . . . . . Ion-Trap Type Requiring External Single-Field Magnet

Tube Dimensions:
- Maximum overall length . . . . . 22-5/8"
- Greatest width at lip . . . . . 19-23/32" ± 1/8"
- Greatest height at lip . . . . . 15-5/16" ± 1/8"
- Diagonal at lip . . . . . 20-3/4" ± 1/4"
- Neck length . . . . . 7-1/2" ± 3/16"
- Radius of curvature of faceplate (External surface) . . 33"

Screen Dimensions (Minimum): ←
- Greatest width . . . . . 18-1/8"
- Greatest height . . . . . 13-11/16"
- Diagonal . . . . . 19-1/8"

Operating Position . . . . . Any
Ultor Terminal . . . . . Metal-Shell Lip
Base . . Small-Shell Duodecal 6-Pin (JETEC Group 4, No. B6-63) ←
Basing Designation for BOTTOM VIEW . . . . . 12M ←

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



Metal-Shell Lip - Ultor (Grid No.3, Grid No.5, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

← Indicates a change.

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

21MP4

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

21FP4D

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
70° MAGNETIC DEFLECTION

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	750 max. 500 min.	pf pf
Heater Current at 6.3 volts	600 ± 60	ma
Electron Gun	Type Requiring No Ion-Trap Magnet	

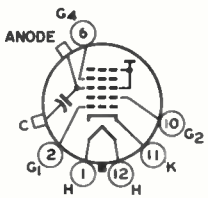
Optical:

Phosphor (For Curves, see front of this Section)	P4—Sulfide Type, Aluminized
Faceplate, Cylindrical	Filterglass
Light transmission (Approx.)	74%

Mechanical:

Weight (Approx.)	29 lbs
Overall Length	23-1/32" ± 3/8"
Neck Length	7-1/2" ± 3/16"
Projected Area of Screen	248 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 J170 A/C* sheets at front of this section	
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Base	Small-Shell Duodecal (JEDEC Group 4, No.B6-63)
Basing 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



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	550 max.	volts

GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts 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	14000	volts
Grid-No.4 Voltage	-56 to +310	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

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
70° MAGNETIC DEFLECTION

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	750 max. 500 min.	pf pf
Heater Current at 6.3 volts	600 ± 60	ma
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For curves, see front of this section)	P4—Sulfide Type, Aluminized
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	75%

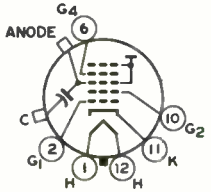
Mechanical:

Weight (Approx.)	24 lbs
Overall Length	23-1/32" ± 3/8"
Neck Length	7-1/2" ± 3/16"
Projected Area of Screen	248 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 J170 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)
Basing 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



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	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts 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	16000	volts
Grid-No.4 Voltage	-64 to +350	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

21ZP4C

Picture Tube

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
70° MAGNETIC DEFLECTION

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	750 max. / 500 min.	pf
Heater Current at 6.3 volts	600 ± 60	ma
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For curves, see front of this section)	P4—Sulfide Type, Aluminized
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	75%

Mechanical:

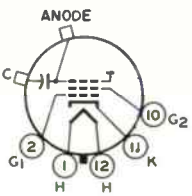
Weight (Approx.)	24 lbs
Overall Length	23-1/32" ± 3/8"
Neck Length	7-1/2" ± 3/16"
Projected Area of Screen	248 sq. in.
External Conductive Coating:	
Type	Regular-Band
Contact area for grounding	Near Reference Line

For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J170 B/D* sheets at front of this section

Cap . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . Small-Shell Duodecal 5-Pin (JEDEC Group 4, No. B5-57)

Basing Designation for BOTTOM VIEW. 12N

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	550 max.	volts

GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts 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	16000	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

23AHP4

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **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)	11	seconds
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	92°	
Horizontal	80°	
Vertical	65°	
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor.	2500 max. / 1700 min.	μμf
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Faceplate	Filterglass
Light transmission at center (Approx.)	78%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Medium Short

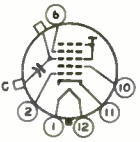
Mechanical:

Tube Dimensions:	
Overall length	18" ± 3/8"
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	50"
Edge	36-3/4"
Screen Dimensions (Minimum):	
Greatest width	19-1/4"
Greatest height	15-1/8"
Diagonal	22-5/16"
Projected area	282 sq. in.
Weight (Approx.)	25 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Bulb	J187C1

23AHP4

Base. . . . . .Short Small-Shell Duodecal 6 Pin
(JEDEC Group 4, B6-203)
Basing 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



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

GRID-DRIVE[A] SERVICE

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

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

ULTOR VOLTAGE	22000 max.	volts
	11000 min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
	200 min.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	220 max.	volts
Negative-bias value	154 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
HEATER VOLTAGE	6.9 max.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor voltage (E_{c_5k}) of	*18000*	*volts*
and grid-No.2 voltage (E_{c_2k}) of	*400*	*volts*
Grid-No.4 Voltage for focus[●]	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster[★]	-36 to -94	volts
Field Strength of Adjustable Centering Magnet[♦]	0 to 11	gausses

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-Maximum Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	22000 max. 11000 min.	volts volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	1250 max.	volts
Negative value	400 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	700 max. 350 min.	volts volts
GRID-No.2-TO-CATHODE VOLTAGE	550 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	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor-to-grid-No.1 voltage ($E_{c_{g_1}}$) of	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage ($E_{c_{g_2}}$) of	*400*	*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★	36 to 78	volts
Field Strength of Adjustable Centering Magnet♦	0 to 11	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.4 (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 2-1/8". 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:

$$\sqrt{\frac{E_{c_5k} \text{ or } E_{c_5g_1} \text{ (volts)}}{16000 \text{ (volts)}}} \times 10 \text{ gausses}$$

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.

♦ 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.

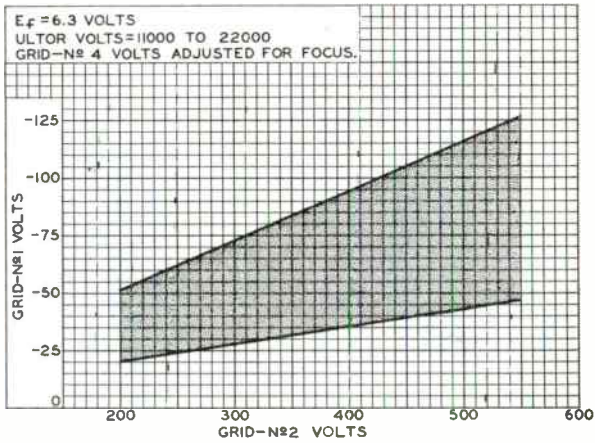
♠ See *Raster-Cutoff-Range Chart for Cathode-Drive Service.*

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 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.

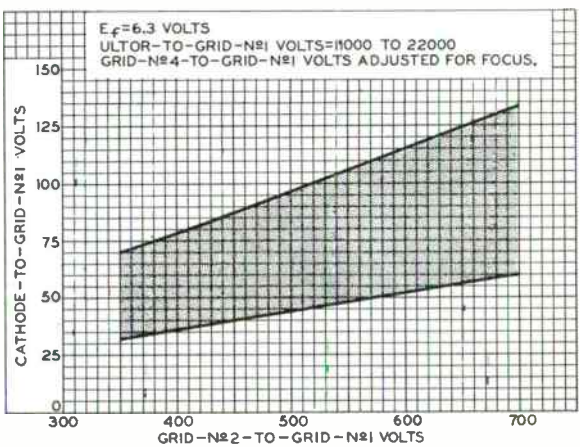
Shatter-Proof Cover Over the Tube Face. Following conventional picture tube practice, it is recommended that the cabinet be provided with a shatterproof, glass cover over the face of this picture tube to protect it from being struck accidentally and to protect against possible damage resulting from tube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

RASTER-CUTOFF-RANGE CHARTS
Grid-Drive Service



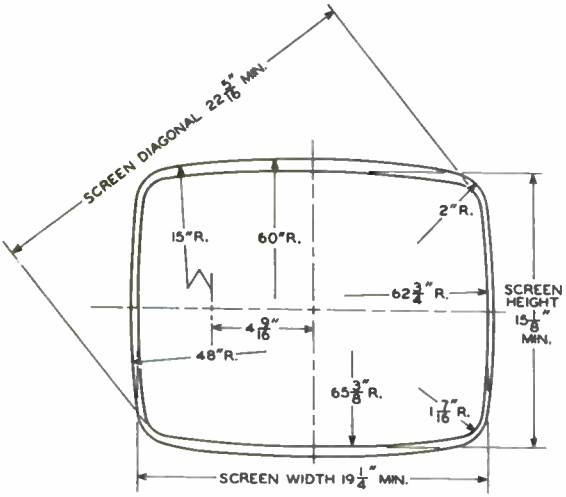
92CS-10620RI

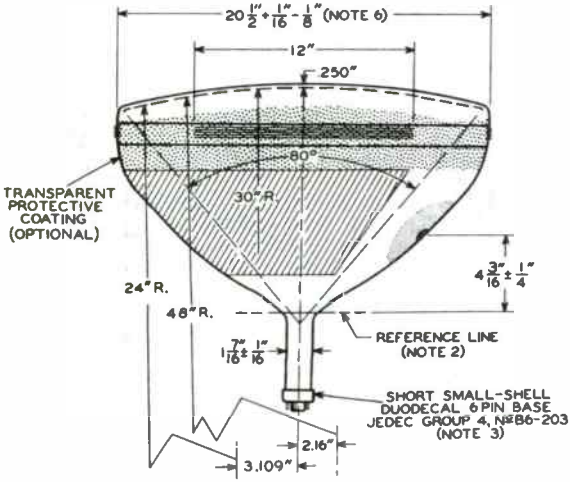
Cathode-Drive Service



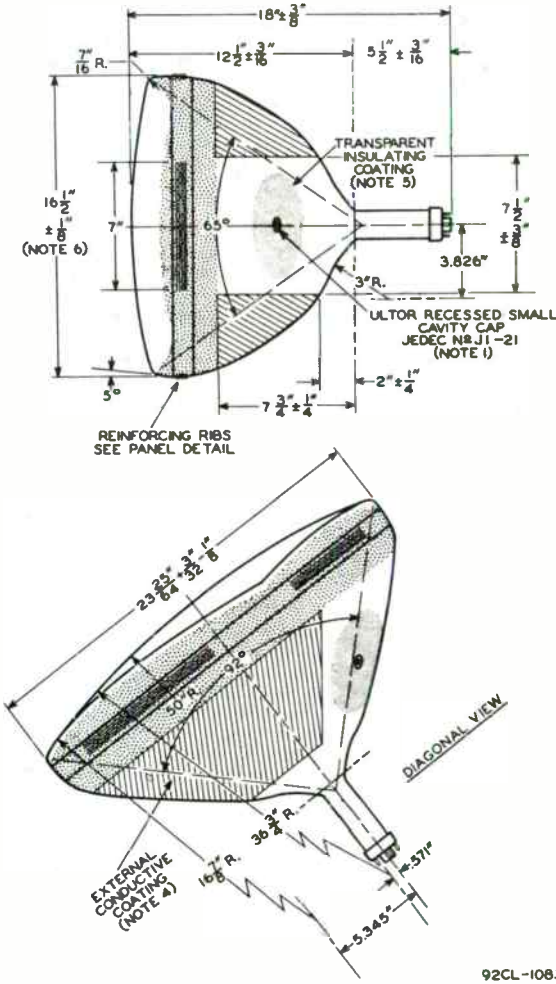
92CS-10825

23AHP4

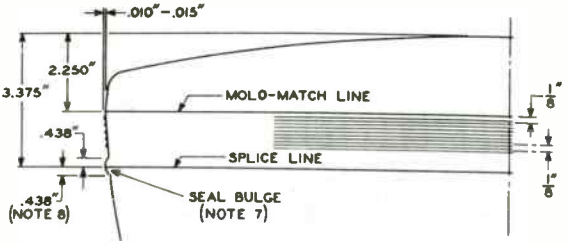




RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.



23AHP4



DETAIL OF PANEL

NOTE 1: THE PLANE THRDUGH 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 ±3D°. 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 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.

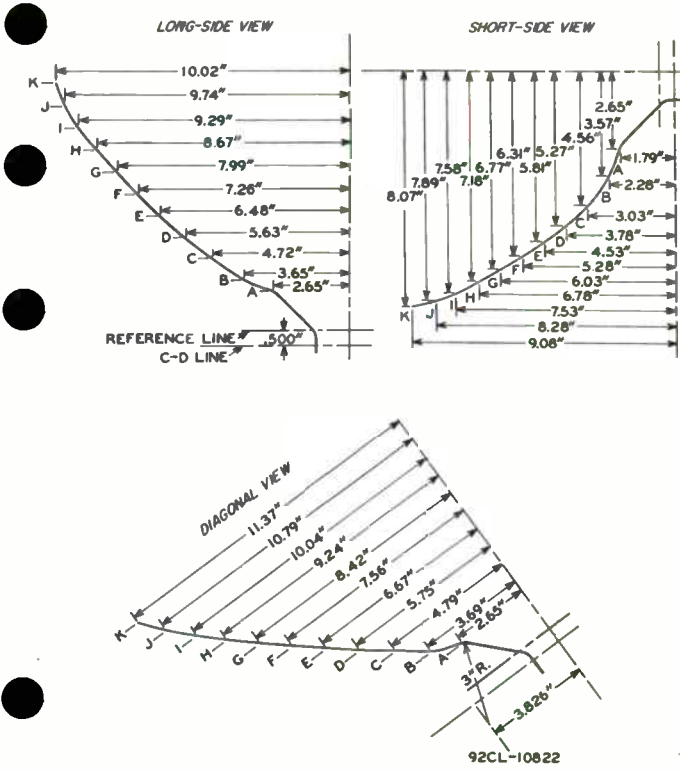
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: MEASURED AT THE MOLD-MATCH LINE.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE 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 LOCATION SPECIFIED FOR DIMENSIONING 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

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

The 23ASP4 is the same as the 23AHP4 except for the following items:

Mechanical:

Tube Dimensions:

Overall length	17" ± 3/8"
Neck length	4-1/2" ± 3/16"

23AWP4

Picture Tube

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION
LOW GRID-No.2 VOLTAGE — CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	92°	
Horizontal	80°	
Vertical	65°	
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	2500 max.	μμf
	1700 min.	μμf
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Faceplate	Filterglass
Light transmission at center (Approx.)	78%
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Medium Short

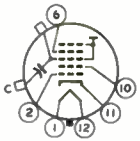
Mechanical:

Tube Dimensions:	
Overall length	18" ± 3/8"
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" ± 1/8"
Curvature of faceplate (Radii):	
Center	50"
Edge	36-3/4"
Screen Dimensions (Minimum):	
Greatest width	19-1/4"
Greatest height	15-1/8"
Diagonal	22-5/16"
Projected area	282 sq. in.
Weight (Approx.)	25 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Bulb	J187C1

23AWP4

Base. . . . . .Short Small-Shell Duodecal 6-Pin
(JEDEC Group 4, B6-203)
Basing 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



Cap – 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-Maximum Values:*

ULTOR-TO-GRID No.1 VOLTAGE.	22000 max. 11000 min.	volts volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value.	1250 max.	volts
Negative value.	400 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	225 max. 40 min.	volts 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.	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	450 max.	volts
After equipment warm-up period. . .	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor-to-grid-No.1 voltage ($E_{c_2g_1}$) of	*20000*	*volts*
and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) 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 extinction of focused raster★	36 to 78	volts
Field Strength of Adjustable Centering Magnet◆	0 to 12	gausses

Maximum Circuit Values:

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

▲ 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.

● The 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-to-grid-No.1 voltage or grid-No.2-to-grid-No.1 voltage within design-maximum ratings shown for these items.

★ See *Raster-Cutoff-Range Chart for Cathode-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:

$$\sqrt{\frac{E_{c5k} \text{ or } E_{c5g1} \text{ (volts)}}{16000 \text{ (volts)}}} \times 10 \text{ gausses}$$

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.

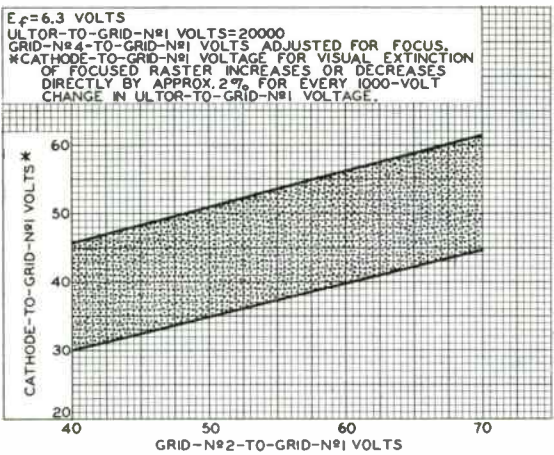
OPERATING CONSIDERATIONS

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.

23AWP4

RASTER-CUTOFF-RANGE CHART
Cathode-Drive Service



92CS-10823

DIMENSIONAL OUTLINE and
BULB-CONTOUR DIMENSIONS
shown under Type 23AHP4 also apply to the 23AWP4

23BJP4

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **92° MAGNETIC DEFLECTION**
LOW GRID-No.2 VOLTAGE — **CATHODE-DRIVE TYPE**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	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	2500 max. / 1700 min.	μμf

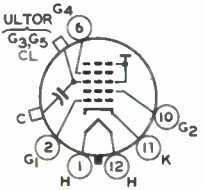
Electron Gun . . . . . .Type Requiring No Ion-Trap Magnet

Optical:

Faceplate. . . . . .Filterglass
Light transmission (Approx.) 78%
Phosphor (For Curves, see front of this Section) .P4—Sulfide Type, Aluminized

Mechanical:

Operating Position . . . . . .Any
Weight (Approx.) . . . . . 25 lbs
Overall Length . . . . . 18-1/8" ± 3/8"
Neck Length. . . . . 5-5/8" ± 3/16"
Projected Area of Screen . . . . . 282 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 J187 C/F* sheets at the front of this section
Cap. . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . . . . Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)
Basing 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

Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

23BJP4

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

ULTOR-TO-GRID-No.1 VOLTAGE	25000 max.	volts
	11000 min.	volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	1250 max.	volts
Negative value	450 max.	volts
GRID-No.2 TO-GRID-No.1 VOLTAGE	225 max.	volts
	40 min.	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	6.9 max.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

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 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

23BKP4

Picture Tube

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

Electrical:

Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	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.	2500 max. 1700 min.	μμf μμf

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

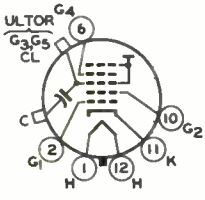
Optical:

Faceplate and Protective Panel. . . . . Filterglass
Light transmission (Approx.). 40%
Phosphor (For Curves, see front of this Section) . P4—Sulfide Type, Aluminized

Mechanical:

Operating Position. . . . . Any
Weight (Approx.). . . . . 35 lbs
Overall Length. . . . . 18-7/16" ± 7/16"
Neck Length . . . . . 5-5/8" ± 3/16"
Projected Area of Screen. . . . . 282 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 J187 D/G* sheets at the front of this section
Cap . . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . .Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)
Basing 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



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

23BKP4

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

ULTOR-TO-GRID-No.1 VOLTAGE	25000 max. 15000 min.	volts volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	1250 max.	volts
Negative value	400 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	225 max. 40 min.	volts 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	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

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 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

23BLP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 92° MAGNETIC DEFLECTION
LOW-GRID-No.2 VOLTAGE — CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

The 23BLP4 is the same as the 23BKP4 except for the following item:

Optical:

Surface of Protective Panel. . . . . .Treated to reduce specular reflection

23BQP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	450 ± 5%	ma
Heater Warm-Up Time (Average)	11	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	2500 max. / 2000 min.	μμf
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

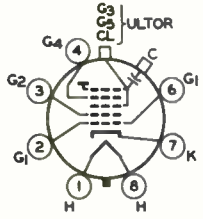
Faceplate and Protective Panel	Filterglass
Light transmission (Approx.)	40%
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type, Aluminized

Mechanical:

Operating Position	Any
Weight (Approx.)	32-1/2 lbs
Overall Length	15-3/16" ± 3/8"
Neck Length	5-1/8" ± 1/8"
Projected Area of Screen	282 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 J187 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)
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

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

23BQP4

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

ULTOR VOLTAGE	23000 max.	volts
	12000 min.	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 peak value	220 max.	volts
Negative bias value	154 max.	volts
Positive bias value	0 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 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with 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 400	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

23BTP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
92° MAGNETIC DEFLECTION

The 23BTP4 is the same as the 23YP4 except for the following item:

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

Anode (Ultor) Voltage. . . . . {25000 max. volts
{15000 min. volts

23CBP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
110° 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
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
92° MAGNETIC DEFLECTION

The 23CGP4 is the same as the 23AHP4 except for the following item:

Electrical:

Heater Current at 6.3 volts. . . . . 450 ± 20 ma

Picture Tube

BI-PANEL 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)	6.3 ± 10%	volts
Current at 6.3 volts	0.6 ± 5%	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	2500 max. 2000 min.	μμf μμf
Faceplate and Protective Panel	Filterglass	
Total light transmission (Approx.)	40%	
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized	
Fluorescence	White	
Phosphorescence	White	
Persistence	Medium Short	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	110°	
Horizontal	99°	
Vertical	82°	
Electron Gun	Type Requiring No Ion-Trap Magnet	
Tube Dimensions:		
Overall length	15-3/16" ± 3/8"	
Greatest width	21-5/16" + 1/8" - 1/16"	
Greatest height	17-5/16" + 1/8" - 1/16"	
Diagonal	24-45/64" + 3/32" - 1/16"	
Neck length	5-1/8" ± 1/8"	

Radius of curvature of protective panel (External surface):

	Radius at center	*Radius at edge*
In plane of diagonal deflection	50-1/4"	See *Dimensional Outline*
In plane of horizontal deflection	50-1/4"	35-1/4"
In plane of vertical deflection	45-1/2"	35"

Radius of curvature of faceplate (Internal surface):

	Radius at center	*Radius at edge*
In plane of diagonal deflection	39-1/2"	31-1/2"
In plane of horizontal deflection	39-3/4"	26-1/2"

23CP4

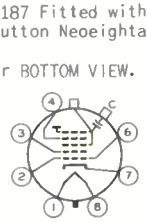
	Radius at center	*Radius at edge*
In plane of vertical deflection.	36-3/4"	18-1/2"

Screen Dimensions (Minimum):
- Greatest width. . . . . .19-5/16"
- Greatest height . . . . . 15-1/4"
- Diagonal. . . . . 22-5/16"
- Projected area. . . . . 282 sq. in.

Weight (Approx.). . . . . 33 lbs
Operating Position. . . . . Any
Cap . . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Bulb. . . . . J187 Fitted with Protective Panel FP198
Base. . . . . Small-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



Cap - Ultor (Grid 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-Center Values:*

ULTOR VOLTAGE	{20000 max. / 12000• min.	volts / volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value.	1000 max.	volts
Negative value.	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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 voltage (E_{c_5k}) between 12000• and 20000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus★.	0 to 400	volts

Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet♦	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*	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster	−44 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:*

ULTOR-TO-GRID-No.1 VOLTAGE	20000	max.	volts
	12000●	min.	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	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	140	max.	volts
Negative-bias value	0	max.	volts
Negative-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.	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.1 voltage ($E_{c_{5g_1}}$) between 12000● and 20000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_{2g_1}}$) between 225 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus★.	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster.	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet◆	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*400*	*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.	42 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): 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 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 11,000 volts below which the serviceability of the 23CP4 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.

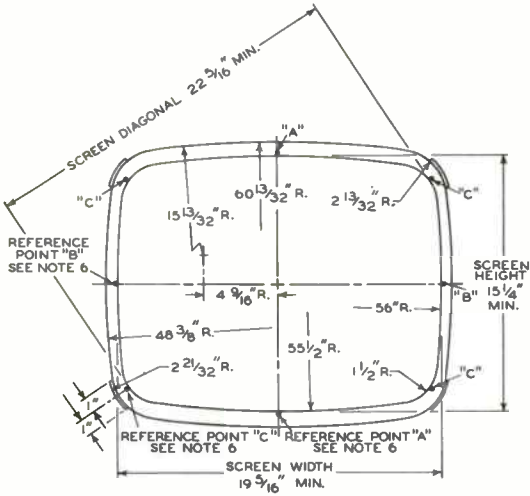
★ The grid-No.4 (or grid-No.4-to-grid-No.1) voltage required for optimum focus of any individual tube may have a value anywhere between 0 and 400 volts; is independent of ultor current; and will remain essentially constant for values of ultor (or ultor-to-grid-No.1) voltage, or grid-No.2 (or grid-No.2-to-grid-No.1) voltage, within design ranges shown for these items.

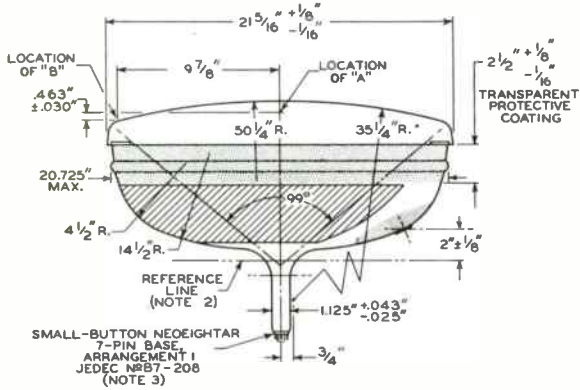
♦ Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

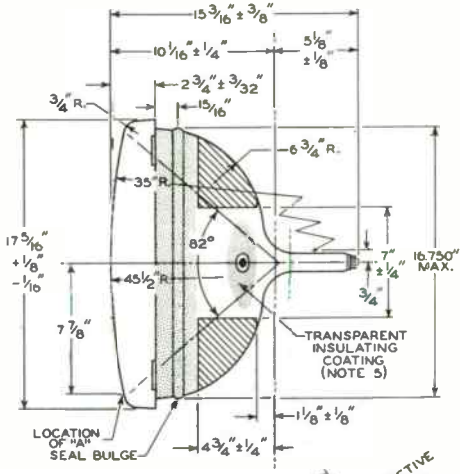
♦ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

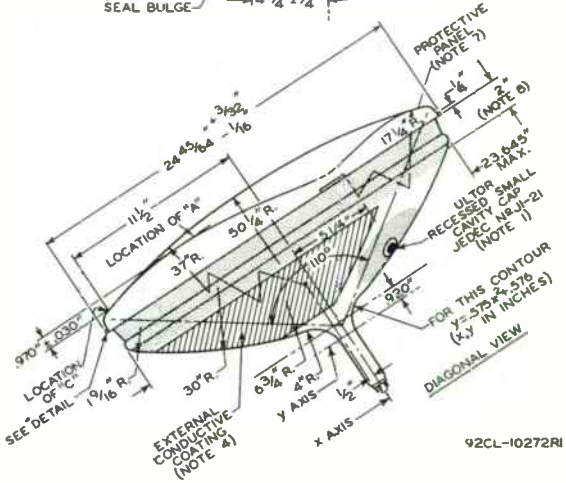
For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section

23CP4

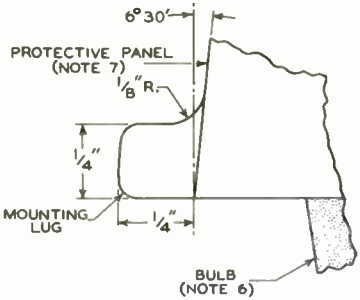








DETAIL OF MOUNTING LUG



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 ± 3D°. 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 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.

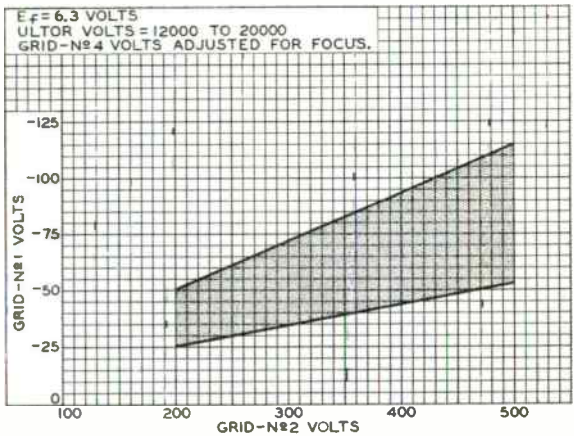
NOTE 6: REFERENCE POINTS A, B, AND C ARE PROVIDED FOR USE IN DESIGN OF A MASK CONTOURED FOR CLOSE FIT TO THE PROTECTIVE PANEL.

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



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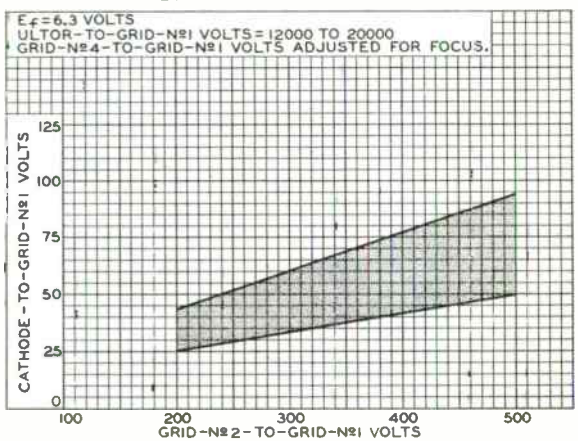
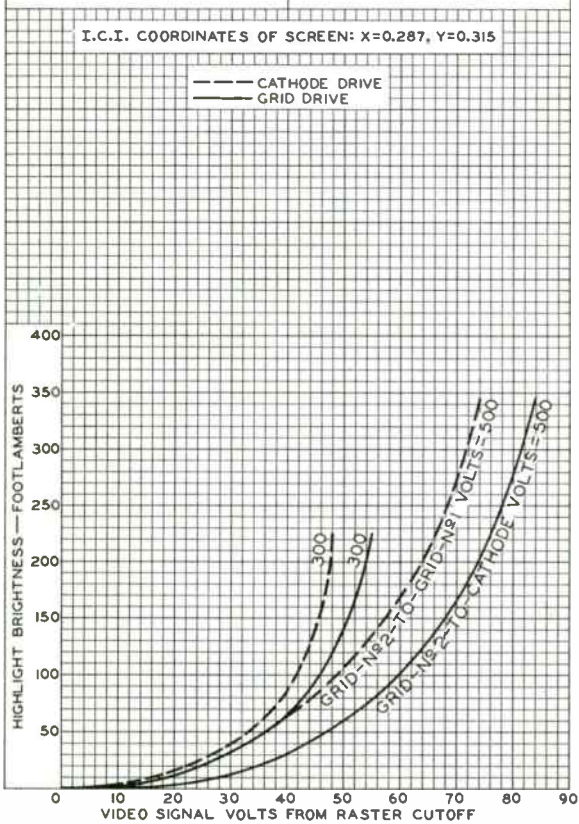
Cathode-Drive Service



92CS-10313

AVERAGE DRIVE CHARACTERISTICS

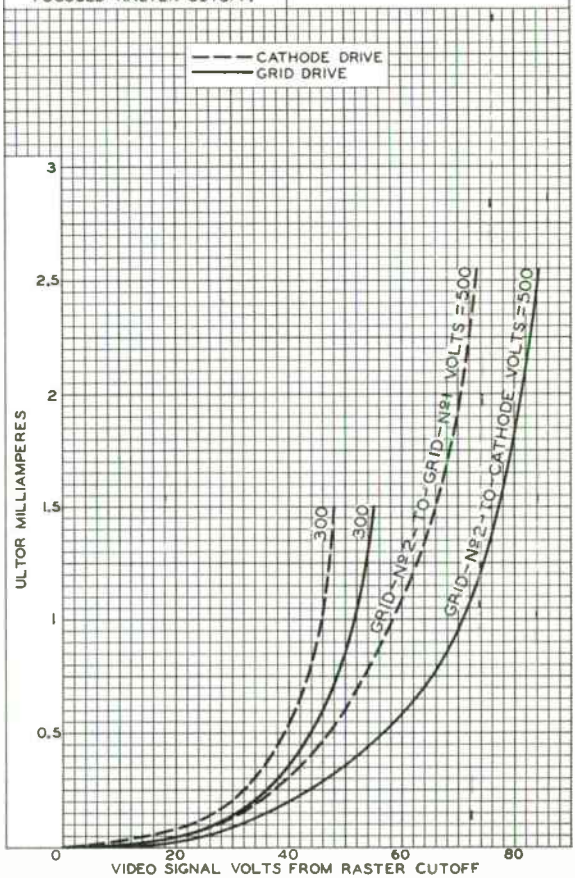
CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 18"x 13½"	RASTER SIZE = 18"x 13½"



92CM-10318

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS=12000 TO 20000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 6.3 VOLTS ULTOR VOLTS=12000 TO 20000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



92CM-10317

23CP4A

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° 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	6	pf
External conductive coating to anode	2500 max. 2000 min.	pf pf
Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

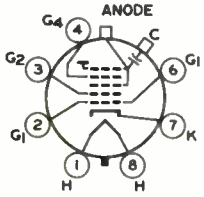
Optical:

Phosphor (For Curves, see front of this Section) . P4—Sulfide Type, Aluminized
Faceplate and Protective Panel . . . . . Filterglass
Light transmission (Approx.) 40%

Mechanical:

Weight (Approx.) . . . . . 33 lbs
Overall Length . . . . . 15-3/16" ± 3/8"
Neck Length . . . . . 5-1/8" ± 1/8"
Projected Area of Screen . . . . . 282 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 J187 A* sheets 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

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

23CP4A

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

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

ANODE VOLTAGE	23500 max.	volts
	14000 min.	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 peak value	220 max.	volts
Negative bias value	154 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	300 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	18000	volts
Grid-No.4 Voltage	0 to 400	volts
Grid-No.2 Voltage	400	volts
Grid-No.1 Voltage for visual extinction of focused raster	-44 to -94	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

23DAP4

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **94° MAGNETIC DEFLECTION**

Low-Grid-No.2-Voltage Type
for Cathode-Drive Operation

GENERAL DATA

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. / 1700 min.	pf / pf
Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

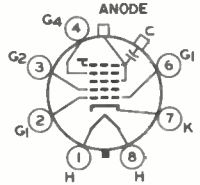
Phosphor (For curves, see front of this section)	P4--Sulfide Type, Aluminized
Faceplate	Filterglass
Light transmission (Approx.)	78%

Mechanical:

Weight (Approx.)	27 lbs
Overall Length	17-5/64" ± 5/16"
Neck Length	5" ± 1/8"
Projected Area of Screen	282 sq. in.
External Conductive Coating:	
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 J187 H:* 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)
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

Cap – Anode (Grid No.3, Grid No.5, Screen, Collector)
C – External Conductive Coating

23DAP4

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

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

ANODE VOLTAGE	23000 max.	volts
	10000 min.	volts
GRID-No.4 VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	70 max.	volts
	40 min.	volts
CATHODE VOLTAGE:		
Negative peak value	2 max.	volts
Negative bias value	0 max.	volts
Positive bias value	100 max.	volts
Positive peak value	150 max.	volts
HEATER VOLTAGE	6.9 max.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode:		
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

Anode Voltage	18000	volts
Grid-No.4 Voltage[a]	100	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

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

[a] The grid-No.4 voltage required for optimum focus of any individual tube will have a value anywhere between -100 and +300 volts.

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS
LOW GRID-No.2 VOLTAGE

ALUMINIZED SCREEN
MAGNETIC DEFLECTION
CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.6	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	2500 max. 1700 min.	μμf μμf
Faceplate and Protective Panel	Filterglass	
Total light transmission (Approx.)	40%	
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized	
Fluorescence	White	
Phosphorescence	White	
Persistence	Medium Short	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	110°	
Horizontal	99°	
Vertical	82°	
Electron Gun	Type Requiring No Ion-Trap Magnet	
Tube Dimensions:		
Overall length	15-3/16" ± 3/8"	
Greatest width	21-5/16" + 1/8" - 1/16"	
Greatest height	17-5/16" + 1/8" - 1/16"	
Diagonal	24-45/64" + 3/32" - 1/16"	
Neck length	5-1/8" ± 1/8"	

Radius of curvature of protective panel (External surface):

	Radius at center	*Radius at edge*
In plane of diagonal deflection	50-1/4"	See *Dimensional Outline*
In plane of horizontal deflection	50-1/4"	35-1/4"
In plane of vertical deflection	45-1/2"	35"

Radius of curvature of faceplate (Internal surface):

	Radius at center	*Radius at edge*
In plane of diagonal deflection	39-1/2"	31-1/2"

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	Radius at center	*Radius at edge*
In plane of horizontal deflection	39-3/4"	26-1/2"
In plane of vertical deflection	36-3/4"	18-1/2"

Screen Dimensions (Minimum):
- Greatest width . . . . . 19-5/16"
- Greatest height . . . . . 15-1/4"
- Diagonal . . . . . 22-5/16"
- Projected area . . . . . 282 sq. in.

Weight (Approx.) . . . . . 33 lbs
Operating Position . . . . . Any
Cap . . . . . Recessed Small Cavity (JEDEC No. J1-21)
Bulb . . . . . J187 Fitted with Protective Panel FP198
Base . . . . . Small-Button Neoeightar 7-Pin Arrangement 2, (JEDEC No. B7-219)
Basing Designation for BOTTOM VIEW 8KP

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

Pin 8 - Grid No.4
Cap - 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 max. / 12000● min.	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:		
Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No. 1 voltage ($E_{c_5g_1}$) between 12000● and 20000 volts and grid-No. 2-to-grid No. 1 voltage ($E_{c_2g_1}$) between 40 and 64 volts

Grid-No. 4-to-Grid-No. 1 Voltage for focus★	0 to 400	volts
Cathode-to-Grid-No. 1 Voltage ($E_{k_{g_1}}$) 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 (Peak negative)	Same value as determined for $E_{k_{g_1}}$ except video drive is a negative voltage	
Grid-No. 4 Current	−25 to +25	μa
Grid-No. 2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet♦	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No. 1 voltage of	*16000*	*18000*	*volts*
and grid-No. 2-to-grid-No. 1 voltage of	*50*	*50*	*volts*
Grid-No. 4-to-Grid-No. 1 Voltage for focus★	0 to 400	0 to 400	volts
Cathode-to-Grid-No. 1 Voltage for visual extinction of focused raster	32 to 47	34 to 49	volts
Cathode-to-Grid-No. 1 Video Drive from Raster Cutoff (Black level): White-level value	−32 to −47	−34 to −49	volts

Maximum Circuit Values:

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

▲ 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.

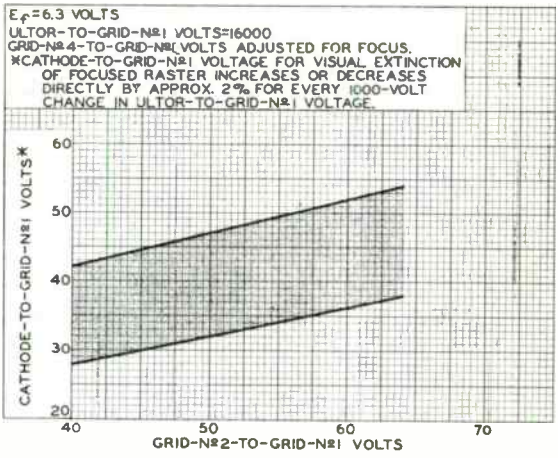
● This value is a working design-center minimum. The equivalent *absolute minimum* ultor-to-grid-No. 1 voltage is 11,000 volts below which the serviceability of the 23EP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable 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 2-1/4". 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.

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



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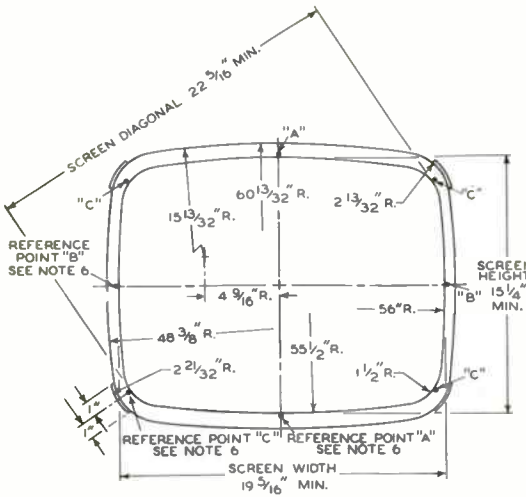
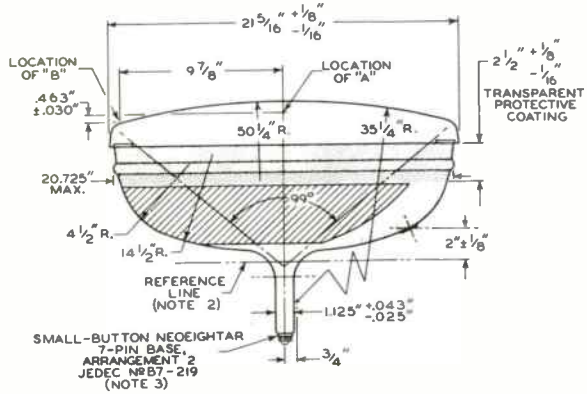
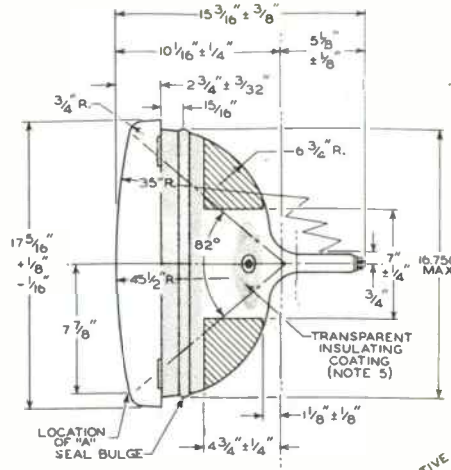
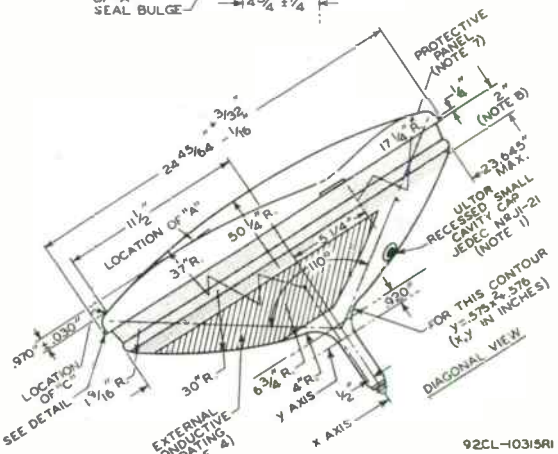
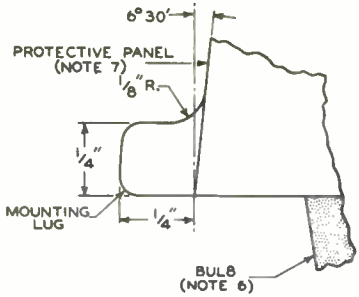








DETAIL OF MOUNTING LUG



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 8 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 8.

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.

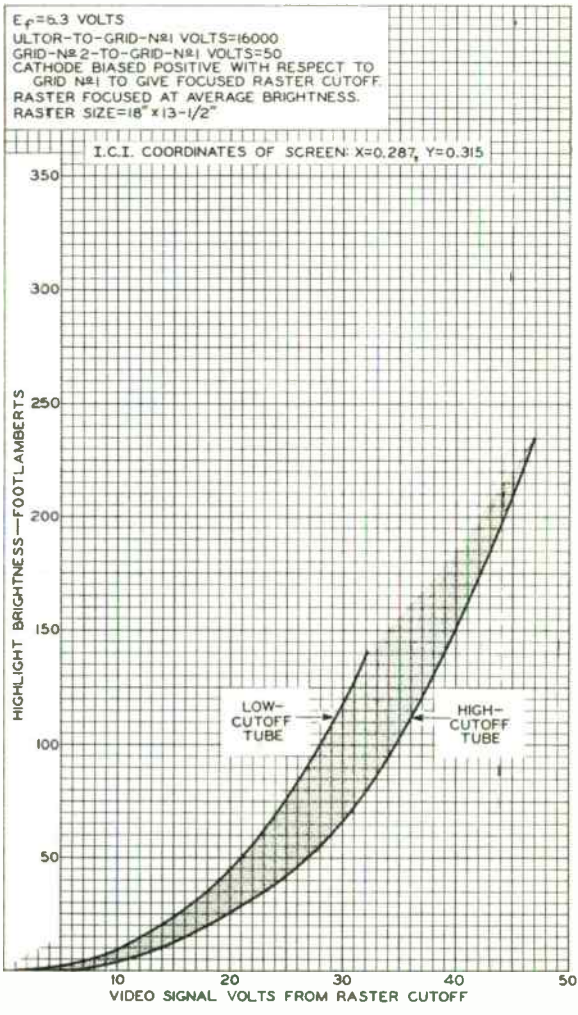
NOTE 6: REFERENCE POINTS A, B, AND C ARE PROVIDED FOR USE IN DESIGN OF A MASK CONTOURED FOR CLOSE FIT TO THE PROTECTIVE PANEL.

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 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.

CATHODE-DRIVE CHARACTERISTICS



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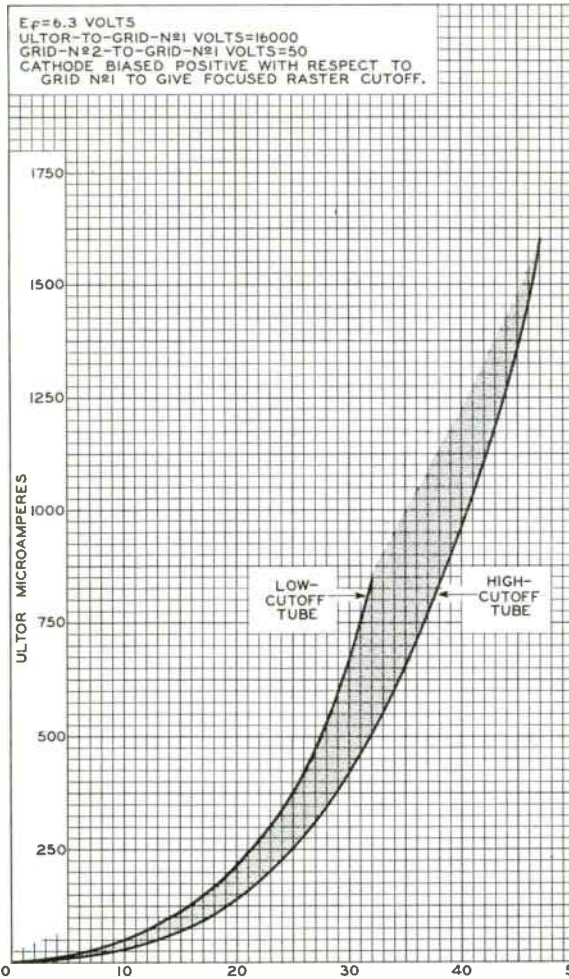
23EP4

CATHODE-DRIVE CHARACTERISTICS



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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 — **114° MAGNETIC DEFLECTION**
NO ION-TRAP MAGNET REQUIRED

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[a]	2500 max. 1700 min.	pf pf
Heater Current at 6.3 volts	450 ± 20	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

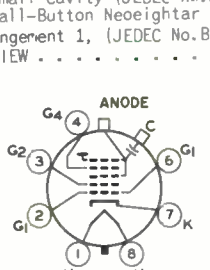
Optical:

Phosphor (For Curves, see front of this Section) . . P4—Sulfide Type, Aluminized
Faceplate . . . . . Filterglass
Light Transmission (Approx.) 42%

Mechanical:

Weight (Approx.) . . . . . 28 lbs
Overall Length . . . . . 14.531" ± 0.281"
Neck Length . . . . . 5.125" ± .125"
Projected Area of Screen . . . . . 282 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 J187L sheets* 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

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 and Minimum Ratings, *Design-Maximum Values:*

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

Anode Voltage	23000 max. 11000 min.	volts volts
Grid-No.4 (Focusing) Voltage:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
Grid-No.2 Voltage	550 max. 200 min.	volts volts
Grid-No.1 Voltage:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
Heater Voltage	6.9 max. 5.7 min.	volts 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 and 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

Anode Voltage	18000	volts
Grid-No.4 Voltage[b]	200	volts
Grid-No.2 Voltage	300	volts
Cathode Voltage for visual extinction of focused raster	28 to 62	volts
Field Strength of required adjustable centering magnet	0 to 12	gauss

Maximum Circuit Values:

Grid-No.1 Circuit Resistance	1.5 max.	megohms

[a] External conductive coating and implosion protection hardware must be grounded.

[b] 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 and video-signal-voltage adjusted to give a 200-microampere anode current.

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

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 — 110° MAGNETIC DEFLECTION
NO ION-TRAP MAGNET REQUIRED

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[a] .	2500 max.	pf
	1700 min.	pf
Heater Current at 6.3 volts.	600 ± 30	ma
Heater Warm-Up Time (Average).	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For Curves, see front of this Section) .	P4—Sulfice Type, Aluminized
Faceplate.	Filterglass
Light Transmission at center (Approx.)	42%

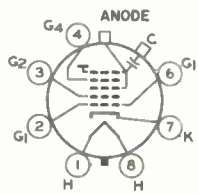
Mechanical:

Weight (Approx.)	28 lbs
Overall length	14.875" ± .281"
Neck length.	5.125" ± .125"
Projected Area of Screen	282 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 J187 K* sheets 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

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



23ETP4

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

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

Anode Voltage	23000 max.	volts
	11000 min.	volts
Grid-No.4 Voltage:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
Grid-No.2 Voltage	550 max.	volts
	200 min.	volts
Grid-No.1 Voltage:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
Heater Voltage	6.9 max.	volts
	5.7 min.	volts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	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

Anode Voltage	18000	volts
Grid-No.4 Voltage[b]	200	volts
Grid-No.2 Voltage	300	volts
Cathode Voltage for visual extinction of focused raster	28 to 62	volts
Field Strength of required adjustable Centering Magnet	0 to 12	gauss

Maximum Circuit Value:

Grid-No.1 Circuit Resistance	1.5 max.	megohms

[a] Includes implosion protection hardware.

[b] 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 RCA-2F21 monoscope, or equivalent.

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

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 — 92° MAGNETIC DEFLECTION

NO ION-TRAP MAGNET REQUIRED

Low-Grid-No.2 Voltage—for Cathode-Drive Operation

The 23FBP4 is the same as the 23ENP4 except for the following item:

Optical:

Surface of Protective Panel. . . . . .Treated to reduce specular reflection

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 — **110° MAGNETIC DEFLECTION**

NO ION-TRAP MAGNET REQUIRED

Low-Grid-No.2-Voltage—for Cathode-Drive Operation

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[a] .	2500 max.	pf
	1700 min.	pf
Heater Current at 6.3 volts.	450 ± 20	ma
Heater Warm-Up Time (Average).	11	seconds
Electron Gun	.Type Requiring No Ion-Trap Magnet	

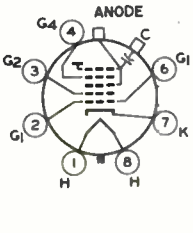
Optical:

Phosphor (For curves, see front of this Section) .P4—Sulfide Type, Aluminized
Faceplate. . . . . .Filterglass
Light transmission at center (Approx.) 42%

Mechanical:

Weight (Approx.) . . . . . 28 lbs
Overall Length . . . . . 14.875" ± .281"
Neck Length. . . . . 5.125" ± .125"
Projected Area of Screen . . . . . 282 sq. in.
External Conductive Coating:
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 J187 K* 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)
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



Cap – Anode (Grid No.3, Grid No.5, Screen, Collector)
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	23000 max.	volts
	11000 min.	volts
Grid-No.4 Voltage:		
Positive value	1250 max.	volts
Negative value	400 max.	volts
Grid-No.2 Voltage	770 max.	volts
	140 min.	volts
Cathode Voltage:		
Negative peak value	2 max.	volts
Negative bias value	0 max.	volts
Positive bias value	100 max.	volts
Positive peak value	150 max.	volts
Heater Voltage	6.9 max.	volts
	5.7 min.	volts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	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

Anode Voltage	18000	volts
Grid-No.4 Voltage[b]	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	0 to 12	gauss

Maximum Circuit Value:

Grid-No.1 Circuit Resistance	1.5 max.	megohms

[a] Includes implosion protection hardware.

[b] 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 RCA-2F21 monoscope, or equivalent.

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

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 — 110° MAGNETIC DEFLECTION

NO ION-TRAP MAGNET REQUIRED

The 23FMP4 is the same as the 22ETP4 except for the following item:

Electrical:

Heater Current at 6.3 volts. . . . . 450 ± 20 ma

23FP4A

Picture Tube

SHORT RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **114° 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	6	pf
External conductive coating to anode	2500 max.	pf
	1700 min.	pf
Heater Current at 6.3 volts	600 ± 60	ma
Heater Warm-Up Time (Average)	11	seconds

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

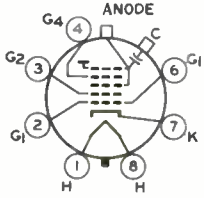
Optical:

Phosphor (For Curves, see front of this Section). P4—Sulfide Type, Aluminized
Faceplate . . . . . Filterglass
Light transmission (Approx.). 78%

Mechanical:

Weight (Approx.). . . . . 24 lbs
Overall Length. . . . . 13-11/16" + 5/16" − 1/4"
Neck Length . . . . . 4-3/8" ± 1/8"
Projected Area of Screen. . . . . 282 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 J187 B* sheets 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

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

23FP4A

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

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

ANODE VOLTAGE	23500 max.	volts
	11000 min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
	200 min.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	200 max.	volts
Negative bias value	154 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode:		
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	14000	volts
Grid-No.4 Voltage	0 to 400	volts
Grid-No.2 Voltage	450	volts
Grid-No.1 Voltage for visual extinction of focused raster	-45 to -105	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

23GP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE

LOW-VOLTAGE ELECTROSTATIC FOCUS — **ALUMINIZED SCREEN**
CONTROLLED HEATER WARM-UP TIME — **MAGNETIC DEFLECTION**

The 23GP4 is the same as the 23CP4 except for the following item:

GRID-DRIVE SERVICE

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

Grid-No.4 (Focusing) Voltage:
Positive Value. . . . . 2000 max. volts

23GJP4A

Picture Tube

PAN-O-PLY TYPE
110° MAGNETIC DEFLECTION

LOW-VOLTAGE ELECTROSTATIC FOCUS
CATHODE-DRIVE TYPE

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. .	1700 min—2500 max	pF
Heater Current at 6.3 V	450 ± 20	mA
Heater Warm-Up Time (Average)	11	s
Electron Gun	Type Requiring No Ion-Trap Magnet	

OPTICAL

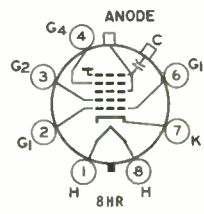
Phosphor. . . . . .P4—Sulfide Type, Aluminized
For curves, see front of this section
Faceplate . . . . . Filterglass
Light transmission at center (approx.). 42%

MECHANICAL

Weight (Approx.). . . . . 28 lb
Overall Length. . . . . 14.250 ± .281 in
Neck Length . . . . . 4.500 ± .125 in
Projected Area of Screen. . . . . 282 sq in
External Conductive Coating[a]
Type. . . . . .Regular-Band
Contact area for grounding. . . . . Near Reference Line
For Additional Information on Coatings Dimensions
See *Picture-Tube Dimensional-Outlines* and *Bulb J187K* sheets 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)

TERMINAL DIAGRAM (Bottom View)

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 – Catnode
Pin 8 – Heater
Cap – Anode (Grid No.3, Grid No.5, Screen, Collector)
C – External Conductive Coating



MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES

Voltages are positive with respect to grid No.1

Anode Voltage	11000 min—23000 max	V
Grid-No.4 Voltage		
Positive value	1250 max	V
Negative value	400 max	V
Grid-No.2 Voltage	40 min—70 max	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	5.7 min—6.9 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		
Combined AC & DC voltage	200 max	V
DC component	100 max	V

TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE

Voltages are positive with respect to grid No.1

Anode Voltage	18000	
Grid-No.4 Voltage	0 to 400	V
Grid-No.2 Voltage	50	V
Cathode Voltage	34 to 52	V
For visual extinction of focused raster		

MAXIMUM CIRCUIT VALUE

Grid-No.1 Circuit Resistance	1.5 max	MΩ

[a] Includes implosion protection hardware.

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

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° MAGNETIC DEFLECTION**
LOW-GRID-NO.2 VOLTAGE — **CATHODE-DRIVE TYPE**

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 . . .	6	pf
External conductive coating to anode. .	2500 max. 2000 min.	pf pf
Heater Current at 6.3 volts	450 ± 25	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun. . . . . Type Requiring No Ion-Trap Magnet		

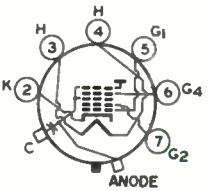
Optical:

Phosphor (For curves, see front of this Section). P4—Sulfide Type, Aluminized
Faceplate and Protective Panel. . . . . Filterglass
Light transmission (Approx.). 40%

Mechanical:

Weight (Approx.). . . . . 32-1/2 lbs
Overall Length. . . . . 15-7/16" ± 7/16"
Neck Length . . . . . 5-3/8" ± 3/16"
Projected Area of Screen. . . . . 282 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 J187 A* sheets at front of this section
Cap . . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . JEDEC No.B6-214
Basing Designation for BOTTOM VIEW. 7FA

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

23JP4

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

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

ANODE VOLTAGE	22000 max. 15000 min.	volts volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	70 max. 44 min.	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	150 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts 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 Cathode-Drive Service:

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

Anode Voltage	16000	volts
Grid-No.4 Voltage	0 to 500	volts
Grid-No.2 Voltage	50	volts
Cathode Voltage for visual extinction of focused raster	35 to 50	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

Picture Tube

PAN-O-PLY TYPE

110° MAGNETIC OEFLECTION LOW-VOLTAGE ELECTROSTATIC FOCUS

The 23HXP4 is the same as the 23ETP4 except for the faceplate which is treated to reduce specular reflections and the following items:

ELECTRICAL

Heater Current at 6.3 V. . . . . 450 ± 20 mA

MECHANICAL

External Conductive Coating

Type . . . . . .Special

Contact area for grounding . . . . . .Near Reference Line

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **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)	11	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	2500 max. / 1700 min.	μμf
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	114°	
Horizontal	102°	
Vertical	84°	
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Faceplate	Filterglass
Light transmission at center (Approx.)	78%
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Medium Short

Mechanical:

Tube Dimensions:	
Overall length	14-3/8" ± 5/16"
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	5-1/8" ± 1/8"

Curvature of faceplate (Radii):

	Center	*Intermediate*	*Edge*
External surface	50"	–	36-3/4"
Internal surface	30"	48"	24"

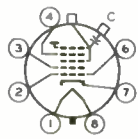
Screen Dimensions (Minimum):	
Greatest width	19-1/4"
Greatest height	15-1/8"
Diagonal	22-5/16"
Projected area	282 sq. in.
Weight (Approx.)	24 lbs
Operating Position	Any
Cap.	Recessed Small Cavity (JEDEC No.J1-21)
Bulb	J187 (114°)

23MP4

Base. . . . . Small-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



Cap - Ultor (Grid 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:*

ULTOR VOLTAGE	22000 max. 11000 min.	volts volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max. 200 min.	volts volts
GRID-No.1 VOLTAGE:		
Negative-peak value	220 max.	volts
Negative-bias value	154 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c5k}) between 11000 and 22000 volts and grid-No.2 voltage (E_{c2k}) between 220 and 550 volts

Grid-No.4 Voltage for focus	0 to 400	volts
Grid-No.1 Voltage (E_{c1k}) for visual extinction of focused raster	See *Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black level): White level value (Peak positive)	Same value as determined for E_{c1k} except video drive is a positive voltage	

Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gauss

Examples of Use of Design Ranges:

With ultor voltage of / *and grid-No.2 voltage of*	*18000* / *400*	*volts* / *volts*
Grid-No.4 Voltage for focus◆	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster	−36 to −94	volts
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	36 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-Maximum Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	22000 max. 11000 max.	volts volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	1250 max.	volts
Negative value	400 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	700 max. 350 min.	volts volts
GRID-No.2-TO-CATHODE VOLTAGE	550 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	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g1}) between 11000 and 22000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 225 and 700 volts

Grid-No.4-to-Grid-No.1 Voltage for focus◆	0 to 400	volts

Cathode-to-Grid-No.1 Voltage (E_{kg1}) for visual extinction of focused raster	See *Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for E_{kg1} except video drive is a negative voltage	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*400*	*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	36 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	−36 to −78	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.

● Individual tubes will have satisfactory focus at some value of grid-No.4 (or grid-No.4-to-grid-No.1) voltage 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 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 No.1 and the other electrodes.

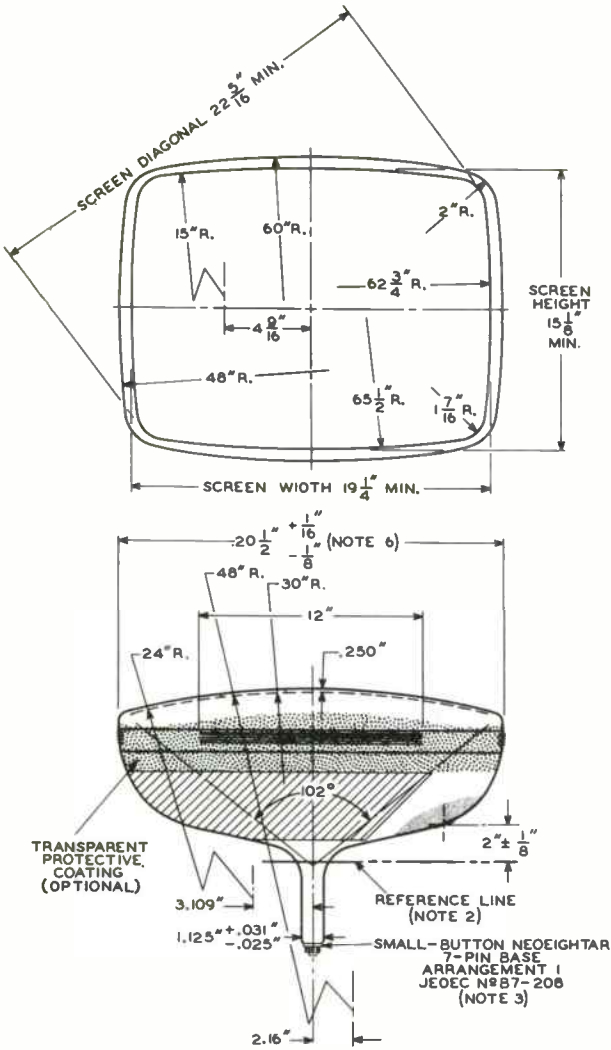
OPERATING CONSIDERATIONS

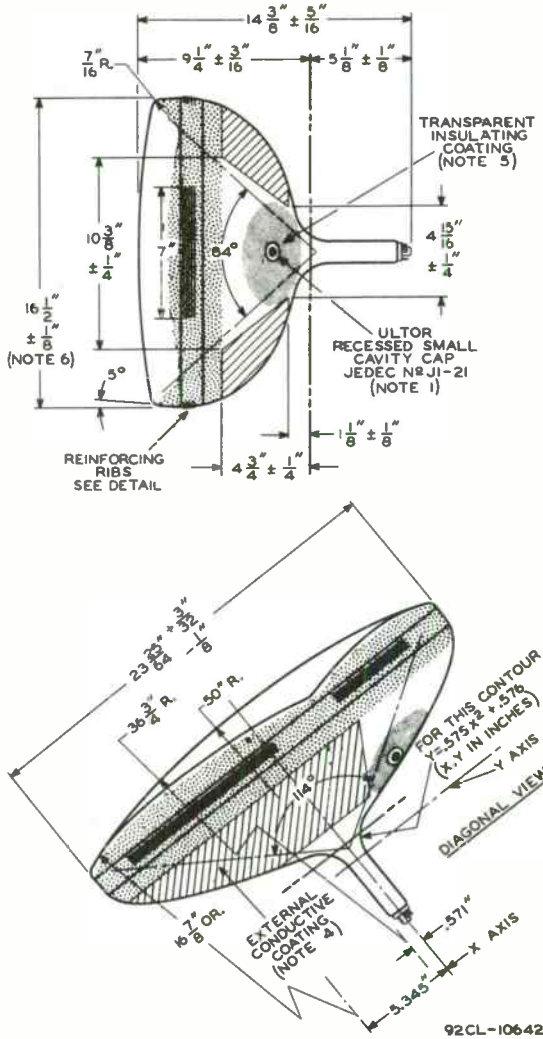
X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, this picture tube does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 22 kilovolts (Design-maximum value), shielding of this picture tube for X-ray radiation may be needed to protect against possible injury from prolonged

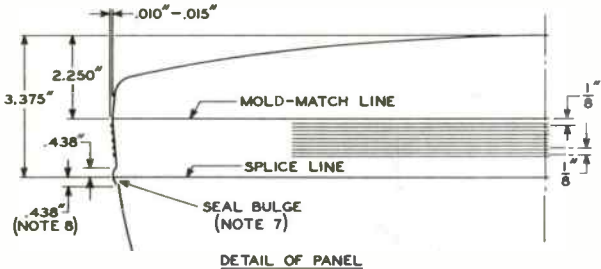
exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

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.

23MP4







DETAIL OF PANEL

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 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 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".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

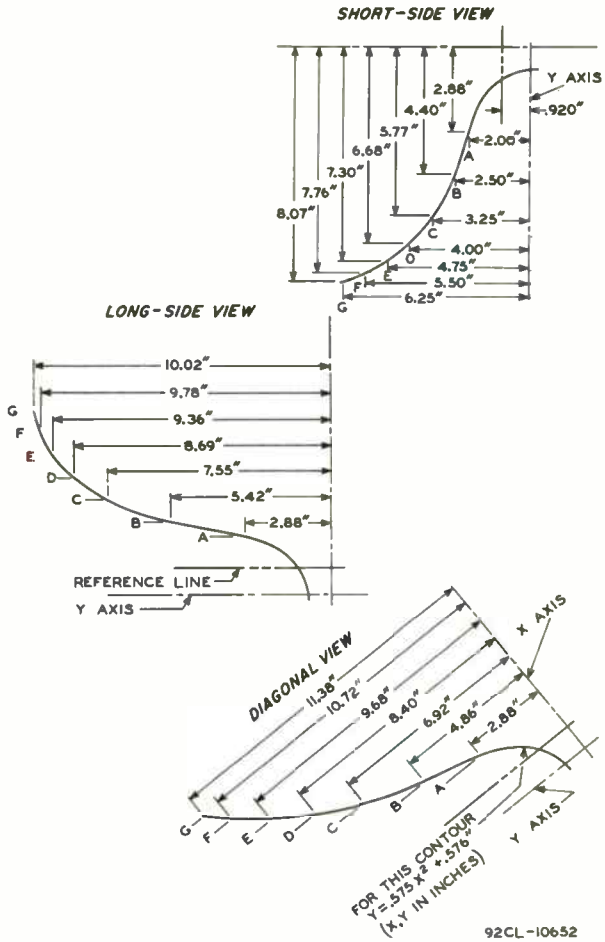
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: MEASURED AT THE MOLD-MATCH LINE.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE 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 LOCATION SPECIFIED FOR DIMENSIONING 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.

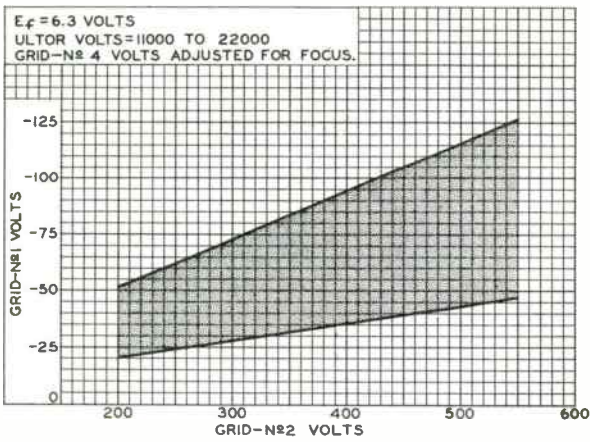
BULB-CONTOUR DIMENSIONS



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.

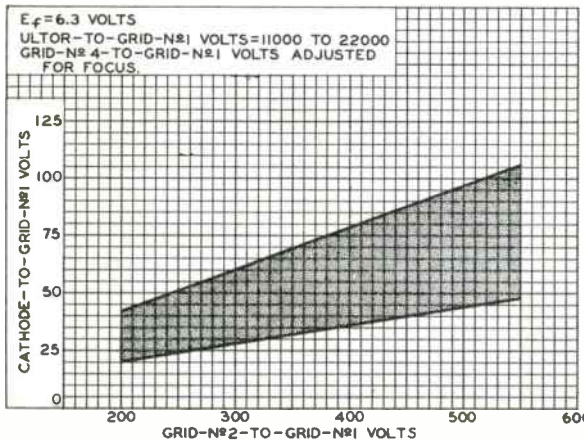
23MP4

RASTER-CUTOFF-RANGE CHARTS
Grid-Drive Service



92CS-10620RI

Cathode-Drive Service

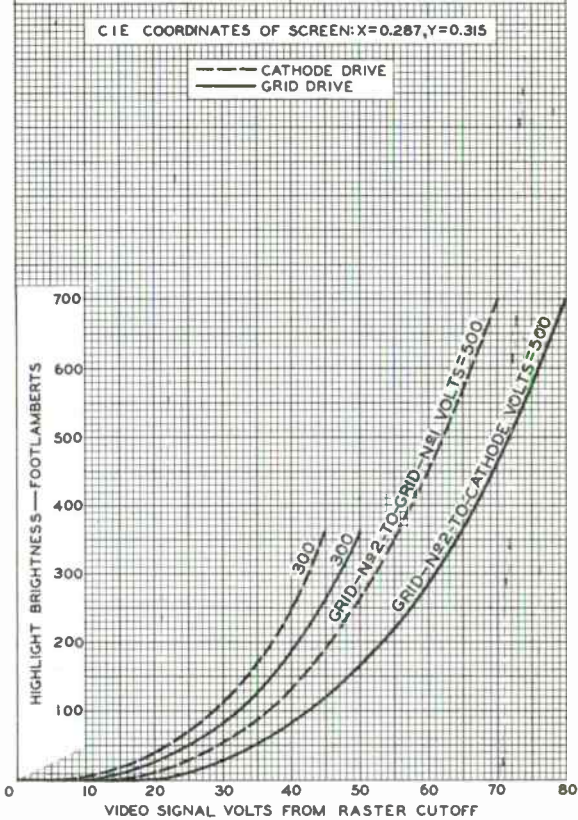


92CS-10621RI

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 18" x 13½"	RASTER SIZE = 18" x 13½"

CIE COORDINATES OF SCREEN: X=0.287, Y=0.315



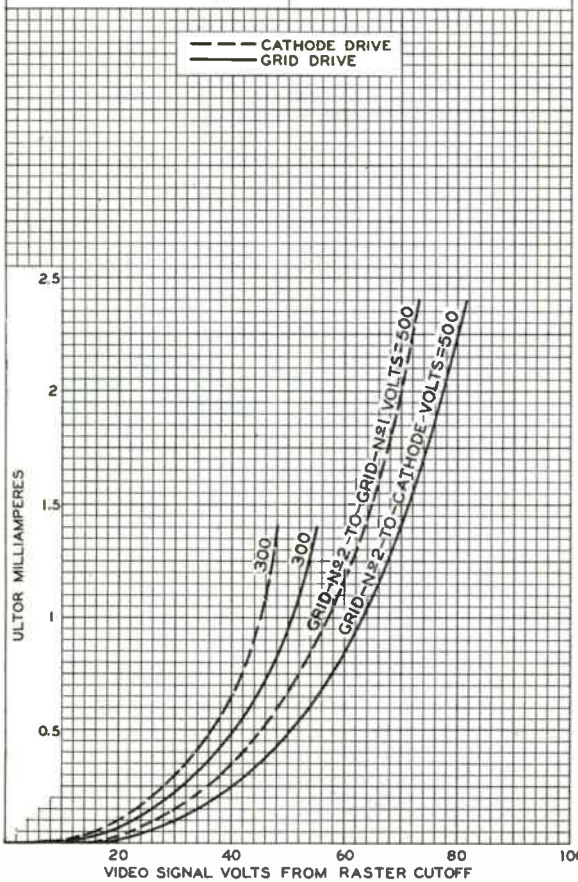
92CM-10625

23MP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE
E_f=6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS=11000 TO 22000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.

GRID-DRIVE SERVICE
E_f=6.3 VOLTS
ULTOR VOLTS=11000 TO 22000
GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



92CM-10618

Picture Tube

NO ION-TRAP MAGNET REQUIRED

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **114° MAGNETIC DEFLECTION**
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	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Faceplate	Filterglass
Light transmission at center (Approx.)	78%

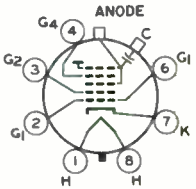
Mechanical:

Weight (Approx.)	24 lbs
Overall Length	14.531" ± .281"
Neck Length	5.125' ± .125"
Projected Area of Screen	282 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 J187 B* sheets 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

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 and Minimum Ratings, *Design-Maximum Values:*

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

Anode Voltage	22000 max.	volts
	11000 min.	volts
Grid-No.4 (Focusing) Voltage:		
Positive value	1250 max.	volts
Negative value	400 max.	volts
Grid-No.2 Voltage	70 max.	volts
	40 min.	volts
Cathode Voltage:		
Negative peak value	2 max.	volts
Negative bias value	0 max.	volts
Positive bias value	155 max.	volts
Positive peak value	220 max.	volts
Heater Voltage	6.9 max.	volts
	5.7 min.	volts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	300 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 Cathode-Drive Service:

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

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

Maximum Circuit Value:

Grid-No.1 Circuit Resistance	1.5 max.	megohms

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

23NP4

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **MAGNETIC DEFLECTION**
LOW GRID-No.2 VOLTAGE — **CATHODE-DRIVE TYPE**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	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	2500 max. 1700 min.	μμf μμf
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	114°	
Horizontal	102°	
Vertical	84°	
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Faceplate	Filterglass
Light transmission at center (Approx.)	78%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Medium Short

Mechanical:

Tube Dimensions:

Overall length	14-3/8" ± 5/16"
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	5-1/8" ± 1/8"

Curvature of faceplate (Radii):

	Center	*Intermediate*	*Edge*
External surface	50"	–	36-3/4"
Internal surface	30"	48"	24"

Screen Dimensions (Minimum):

Greatest width	19-1/4"
Greatest height	15-1/8"
Diagonal	22-5/16"
Projected area	282 sq. in.
Weight (Approx.)	24 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Bulb	J1B7 (114°)

23NP4

Base. . . . . Small-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

Cap – 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-Maximum Values:*

ULTOR-TO-GRID-No.1 VOLTAGE.	22000 max.	volts
	11000 min.	volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value.	1250 max.	volts
Negative value.	400 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	70 max.	volts
	40 min.	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.	6.9 max.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	450 max.	volts
After equipment warm-up period. . . .	200 max.	volts
Heater positive with respect to cathode .	200 max.	volts

Equipment Design Ranges:

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 ($E_{c_2g_1}$) between 44 and 70 volts

Grid-No.4-to-Grid-No.1 Voltage for focus●.	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative value	

Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet*. . . .	0 to 8	gauses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*18000*	*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 extinction of focused raster. . . .	34 to 49	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	−34 to −49	volts

Maximum Circuit Values:

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

▲ 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.

● Individual tubes will have satisfactory focus at some value of grid-No.4-to-grid-No.1 voltage between 0 and 400 volts with the combined bias voltage and video-signal voltage adjusted to give an ultor current of 200 microamperes.

★ Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/8". 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.

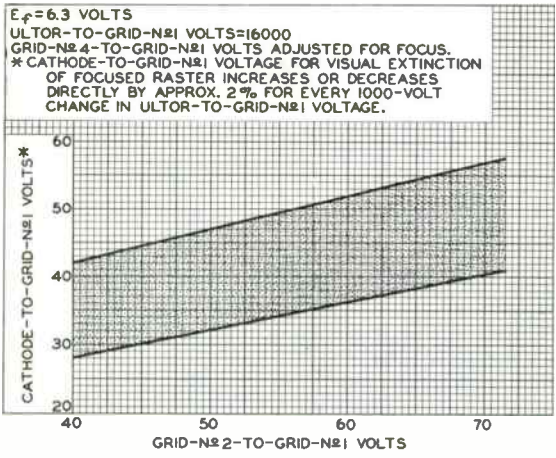
OPERATING CONSIDERATIONS

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 voltage 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 shatter-proof, glass cover over the face of this picture tube to protect it from being struck accidentally and to protect it against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

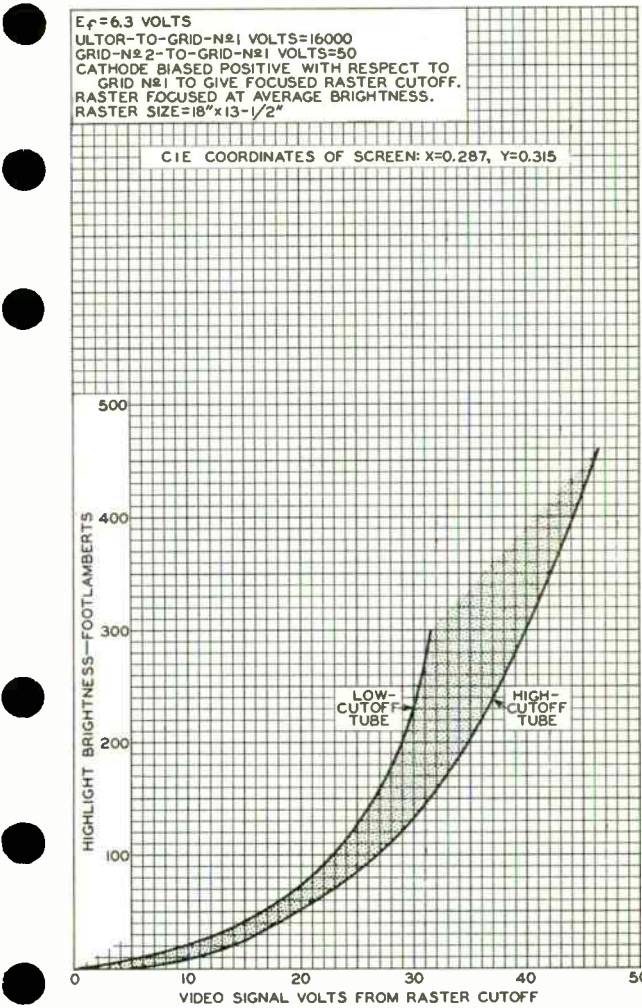
DIMENSIONAL OUTLINE and BULB-CONTOUR DIMENSIONS shown under Type 23MP4 also apply to the 23NP4

RASTER-CUTOFF-RANGE CHART
Cathode-Drive Service



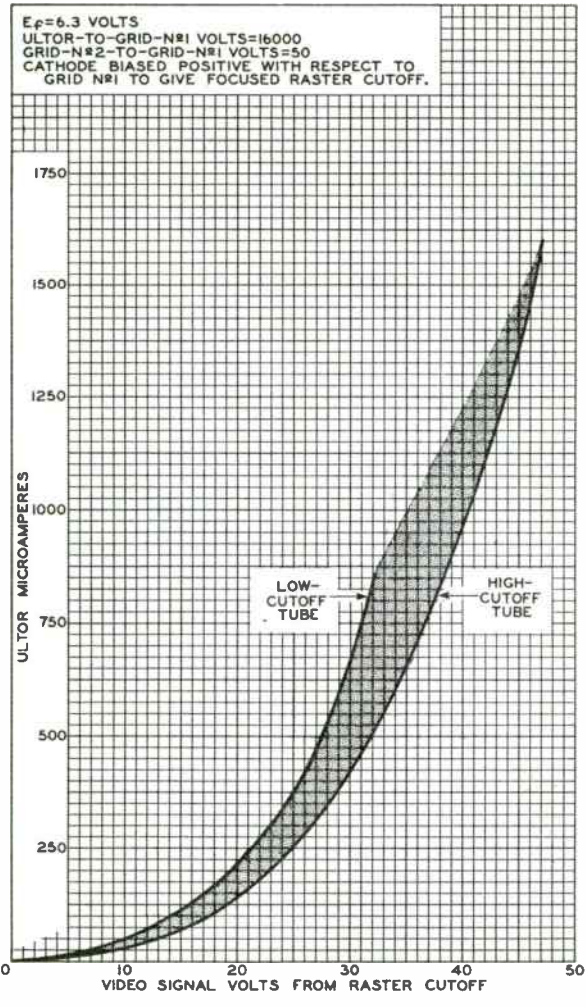
92CS-10623

CATHODE-DRIVE CHARACTERISTICS



23NP4

CATHODE-DRIVE CHARACTERISTICS



92CM-9946R1

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

23YP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **92° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 5%	ma
Heater Warm-Up Time (Average)	11	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	2500 max. / 2000 min.	μμf

Electron Gun . . . . . Type Requiring No Ion-Trap Magnet

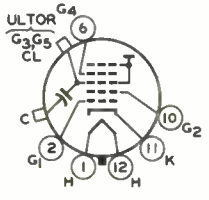
Optical:

Faceplate and Protective Panel . . . . . Filterglass
Light transmission (Approx.) 40%
Phosphor (For curves, see front of this section) . P4—Sulfide Type, Aluminized

Mechanical:

Operating Position . . . . . Any
Weight (Approx.) . . . . . 34-1/2 lbs
Overall Length . . . . . 18-5/16" ± 7/16"
Neck Length . . . . . 5-1/2" ± 3/16"
Projected Area of Screen . . . . . 282 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 J187 D/G* sheets at the front of this section
Cap . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . . . . Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)
Basing 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



Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

23YP4

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

ULTOR VOLTAGE	22000 max. 12000 min.	volts 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 peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 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 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with 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 400	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

24ADP4/24VP4-A/24CP4-A/24TP4

PICTURE TUBE

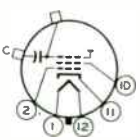
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Capacitance between External Conductive Coating and Ultor	2500 max. 2000 min.	μμf μμf
Faceplate, Spherical		Filterglass
Phosphor (For Curves, see front of this Section)		P4—Sulfide Type Aluminized
Deflection Angles (Approx.):		
Diagonal		90°
Horizontal		85°
Vertical		68°
Electron Gun		Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:		
Overall length		21-1/8" ± 3/8"
Greatest width		22-11/16" ± 1/8"
Greatest height		18-7/16" ± 1/8"
Diagonal		24" ± 1/8"
Neck length		7-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)		40"
Screen Dimensions (Minimum):		
Greatest width		21-7/16"
Greatest height		16-7/8"
Diagonal		22-13/16" ←
Projected area		332 sq. in.
Operating Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Base		Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57) ←
Basing Designation for BOTTOM VIEW		12N

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



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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	22000 max.	volts
GRID No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

← Indicates a change.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

24ADP4/24VP4-A/24CP4-A/24TP4

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

24AEP4
PICTURE TUBE

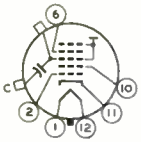
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc 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.	2500 max. μμf 2000 min. μμf
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	75%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	90°
Horizontal	85°
Vertical	68°
Electron Gun	Type Requiring No Ion-Trap Magnet
Tube Dimensions:	
Overall length	19-1/8" ± 3/8"
Greatest width	22-11/16" ± 1/8"
Greatest height	18-7/16" ± 1/8"
Diagonal	24" ± 1/8"
Neck length	5-1/2" ± 3/16"
Screen Dimensions (Minimum):	
Greatest width	21-7/16"
Greatest height	16-7/8"
Diagonal	22-11/16"
Projected area	332 sq. in.
Weight (Approx.)	35 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Bulb	J192
Base	Small-Shell Duodecal 6-Pin (JETEC No.B6-63)
Basing 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



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

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

24AEP4

24AEP4

PICTURE TUBE

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	20000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value*	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	140 max.	volts
Positive bias value	0 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 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 voltage (E_{c_5k}) between 12000# and 20000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus§	−50 to +350	volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet†	0 to 8	gauss

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*18000*	*volts*
and grid-No.2 voltage of	*300*	*400*	*volts*
Grid-No.4 Voltage for focus	−50 to +350	−50 to +350	volts
Grid-No.1 Voltage for visual extinction of focused raster	−28 to −72	−36 to −94	volts

▲,*,#,§,†: See next page.

PICTURE TUBE

Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	28 to 72	36 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 Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	20000 max.	volts
GRID-No.4-TO-GRID-No.1 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 bias value	140 max.	volts
Negative bias value	0 max.	volts
Negative 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.	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.1 voltage ($E_{c_5g_1}$) between 12000# and 20000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 220 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§	−50 to +350	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No.4 Current	−25 to +25	μa

▲,*,#,§,†,■: See next page.

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24AEP4
PICTURE TUBE

Grid-No.2 Current.	−15 to +15		μa
Field Strength of Adjustable Centering Magnet†.	0 to 8		gausses
Examples of Use of Design Ranges:			
With ultor-to-grid-No.1 voltage of	*16000*	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus. . . .	−50 to +350	−50 to +350	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster. . . .	28 to 60	36 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value. . . .	−28 to −60	−36 to −78	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 has been specified to take care of the condition where an ac voltage is provided for dynamic focusing.

\# Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 12000 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-to-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 2-1/2". 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

Curves and Charts shown under Type 24AHP4 also apply to the 24AEP4

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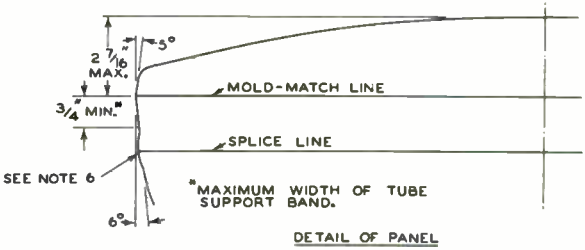
24AEP4

PICTURE TUBE



DETAIL OF PANEL

NOTE 1: THE PLANE THRDUGH THE TUBE AXIS AND PIN 6 MAY VARY FRDM 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 JETEC No. 116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CONTACT 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: 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.

NOTE 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.

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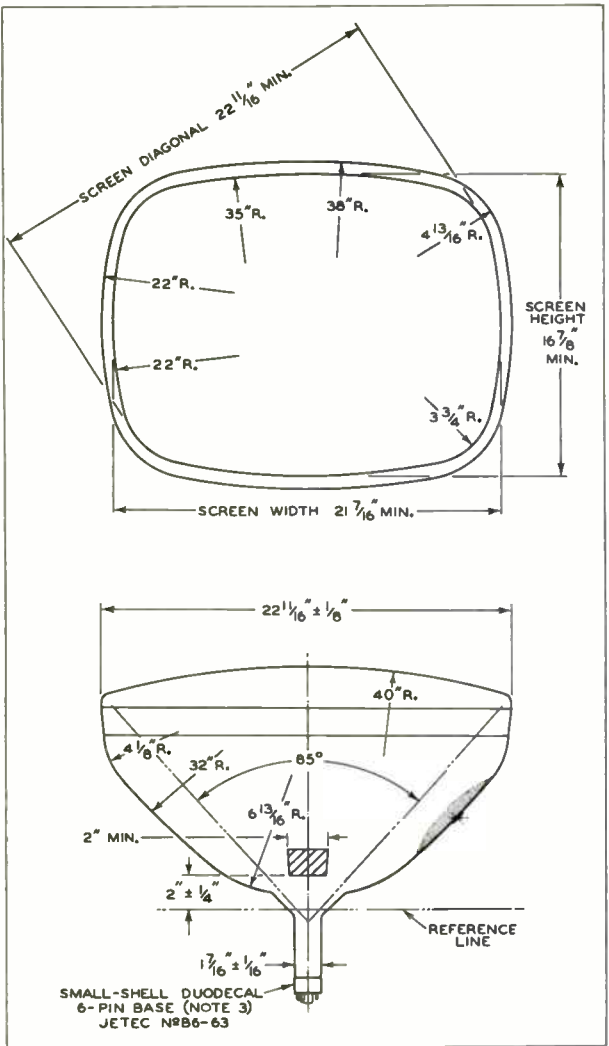
24AEP4

PICTURE TUBE



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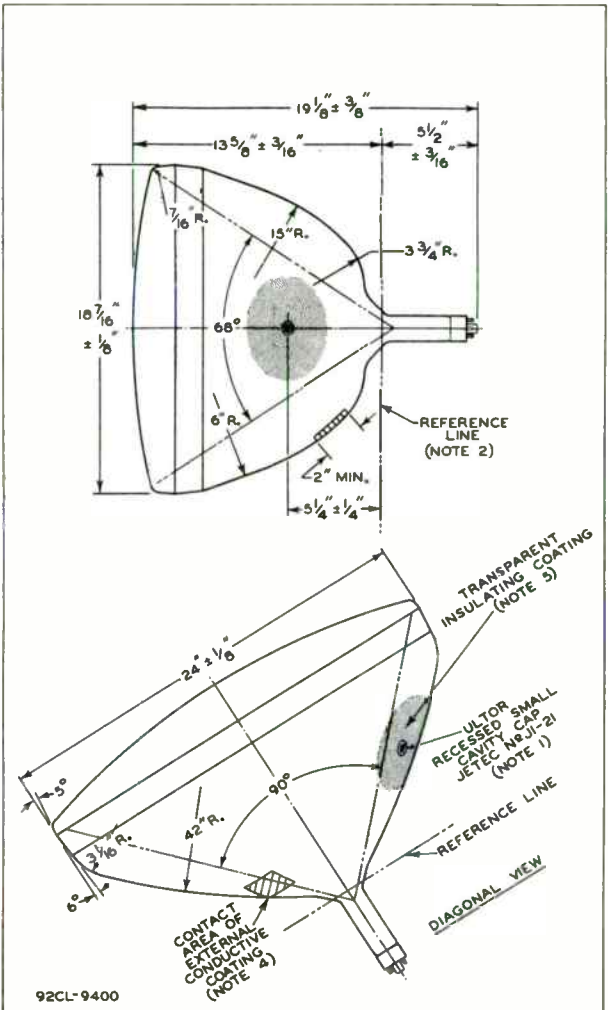
24AEP4

PICTURE TUBE



24AHP4
PICTURE TUBE

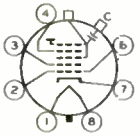
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Uripotential Cathode:	
Voltage	6.3 ac or dc 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	2500 max. μμf; 2000 min. μμf
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	76%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	110°
Horizontal	105°
Vertical	87°
Electron Gun	Type Requiring No Ion-Trap Magnet
Tube Dimensions:	
Overall length	15-7/8" ± 5/16"
Greatest width	22-11/16" ± 1/8"
Greatest height	18-1/2" ± 1/8"
Diagonal	24" ± 1/8"
Neck length	5-7/15" ± 1/8"
Screen Dimensions (Minimum):	
Greatest width	21-7/16"
Greatest height	16-7/8"
Diagonal	22-13/16"
Projected area	332 sq. in.
Weight (Approx.)	28 lbs
Mounting Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Bulb	J192 (110°)
Base	Small-Button Eightar 7-Pin, Arrangement 2, (JETEC No.B7-183)
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



Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

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24AHP4

PICTURE TUBE

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	{20000 max. / 12000*min.	volts / volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	200 max.	volts
Negative bias value	140 max.	volts
Positive bias value	0 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 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 voltage (E_{c_3k}) between 12000 and 20000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for Focus§	-50 to +350	volts
Grid-No.1 Voltage (E_{c_1k}) for Visual Extinction of Focused Raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of / *and grid-No.2 voltage of*	*14000* / *300*	*16000* / *400*	*volts* / *volts*
Grid-No.4 Voltage for Focus	-50 to +350	-50 to +350	volts

▲ Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

,§,: See next page.

RCA

24AHP4

PICTURE TUBE

Grid-No.1 Voltage for Visual Extinction of Focused Raster	−28 to −72	−36 to −94	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	28 to 72	36 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 Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	{20000 max. {12000● min.	volts volts
GRID-No.4-TO-GRID-No.1 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	140 max.	volts
Negative bias value	0 max.	volts
Negative 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.	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.1 voltage ($E_{c_5g_1}$) *between 12000 and 20000 volts*

and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) *between 225 and 640 volts*

Grid-No.4-to-Grid-No.1 Voltage for Focus§	−50 to +350	volts

■ 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.

● This value is a working design-center minimum. The equivalent *absolute minimum* ultor-or ultor-to-grid-No.1 voltage is 11000 volts, below which the serviceability of the 24AHP4 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 11000 volts.

*,§: See next page.

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PICTURE TUBE

Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for Visual Extinction of Focused Raster. . . .	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*		
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative). . . .	Same value as determined for E_{kg_1} except video drive is a negative voltage		
Grid-No.4 Current.	−25 to +25		μa
Grid-No.2 Current.	−15 to +15		μa
Field Strength of Adjustable Centering Magnet* .	0 to 8		gausses
Examples of Use of Design Ranges:			
With ultor-to-grid-No.1 voltage of	*14000*	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for Focus . .	−50 to +350	−50 to +350	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	28 to 60	36 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value.	−28 to −60	−36 to −78	volts
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance.	1.5 max.		megohms

* 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.

§ 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-to-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.

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

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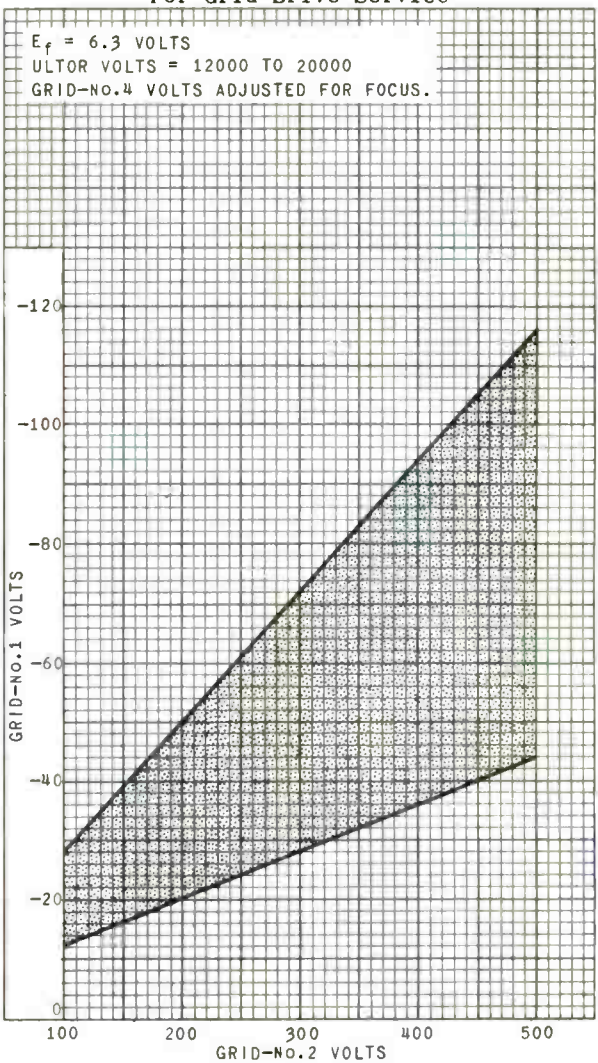
24AHP4
RASTER-CUTOFF-RANGE CHART
For Grid-Drive Service



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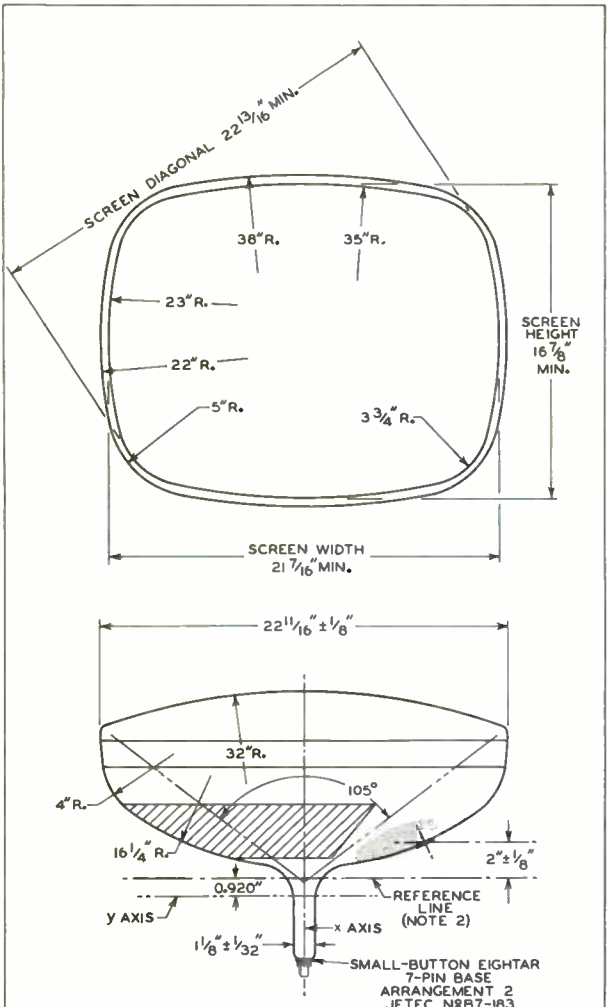
24AHP4

PICTURE TUBE



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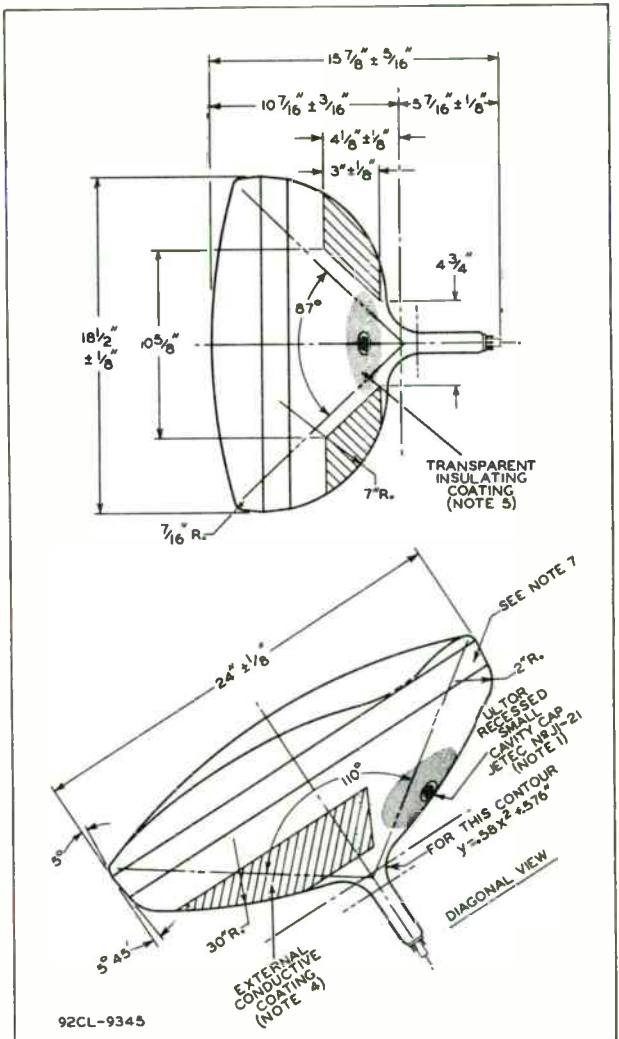
24AHP4

PICTURE TUBE



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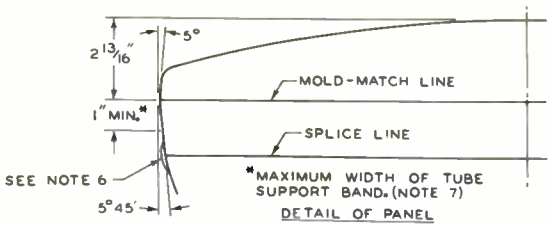
24AHP4

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 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 LINTLESS CLOTH.

NOTE 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.

NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 1" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

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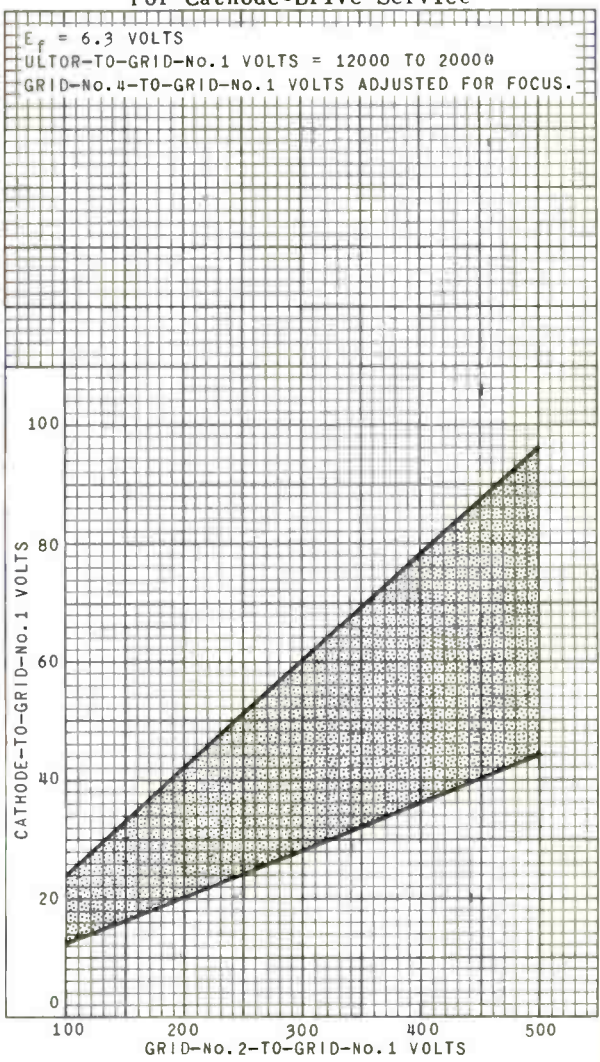
24AHP4

RASTER-CUTOFF-RANGE CHART

For Cathode-Drive Service



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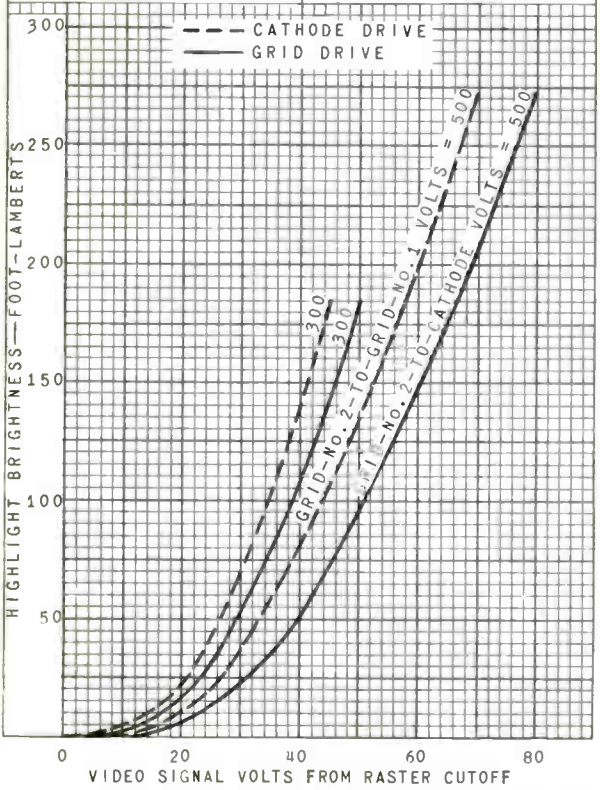
24AHP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-No.1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF.	GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 21" x 16"	RASTER SIZE = 21" x 16"



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92CS-9352

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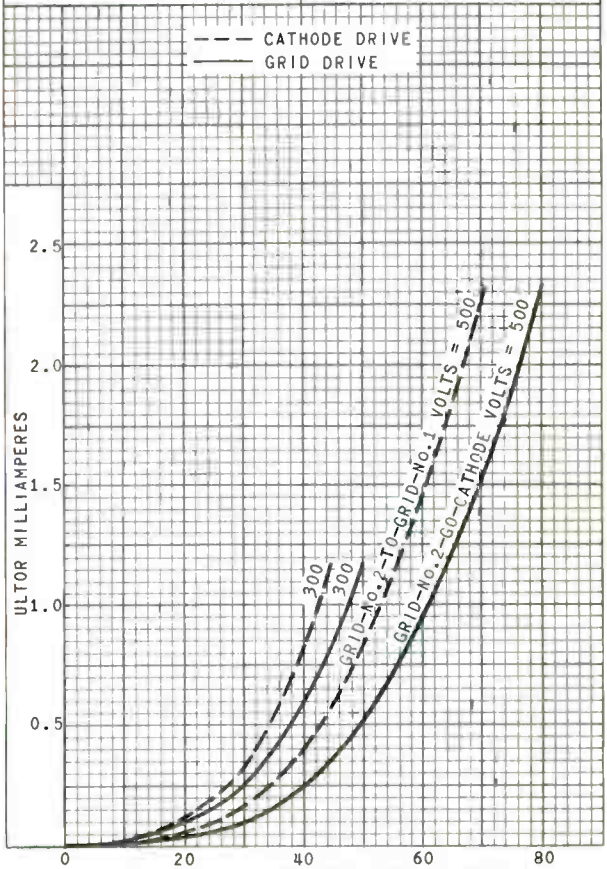
24AHP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-No.1 VOLTS = 12000 TO 20000	ULTOR VOLTS = 12000 TO 20000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF.	GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



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92CS-9351

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS
LOW GRID-No.2 VOLTAGE

ALUMINIZED SCREEN
MAGNETIC DEFLECTION
CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

DATA

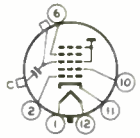
General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current at 6.3 volts	0.6	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	2500 max. 2000 min.	μμf μμf
Faceplate, Spherical	Filterglass	
Light transmission (Approx.)	73%	
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized	
Fluorescence	White	
Phosphorescence	White	
Persistence	Medium Short	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	90°	
Horizontal	85°	
Vertical	68°	
Electron Gun	Type Requiring No Ion-Trap Magnet	
Tube Dimensions:		
Overall length	19-1/8" ± 3/8"	
Greatest width	22-11/16" ± 1/8"	
Greatest height	18-7/16" ± 1/8"	
Diagonal	24" ± 1/8"	
Neck length	5-1/2" ± 3/16"	
Radius of curvature of faceplate (External surface)	40"	
Screen Dimensions (Minimum):		
Greatest width	21-7/16"	
Greatest height	16-7/8"	
Diagonal	22-13/16"	
Projected area	332 sq. in.	
Weight (Approx.)	35 lbs	
Operating Position	Any	
Cap	Recessed Small Cavity (JEDEC No.J1-21)	
Bulb	J192 A2/B2	
Socket	Cinch Part No.9464-12, or equivalent	
Base	Small-Shell Duodecal 6-Pin, Arrangement 1, (JEDEC Group 4, No.B6-63)	

24ATP4

Basing 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



Cap – 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	max.	volts
	12000●	min.	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.	68	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	0	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. . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_{g8_1}}$) between 12000● and 20000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_{g8_1}}$) between 40 and 68 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§.	0 to 400 volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster▲.	See *Raster-Cutoff-Range Chart for Cathode-Drive Service*
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage
Grid-No.4 Current	−25 to +25 μa
Grid-No.2 Current	−15 to +15 μa
Field Strength of Adjustable Centering Magnet●	0 to 8 gauss

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	*50*	*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 . .	32 to 47	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	-32 to -47	volts

Maximum Circuit Values:

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

■ 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.

♣ This 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 24ATP4 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 optimum focus of any individual tube may have a value anywhere between 0 and 400 volts and 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 these items.

▲ The cathode-to-grid-No.1 voltage (E_{kg_1}) will increase by approximately 2 per cent for every 1000-volt increase in ultor-to-grid-No.1 voltage and will decrease by approximately 2 per cent for every 1000-volt decrease in ultor-to-grid-No.1 voltage.

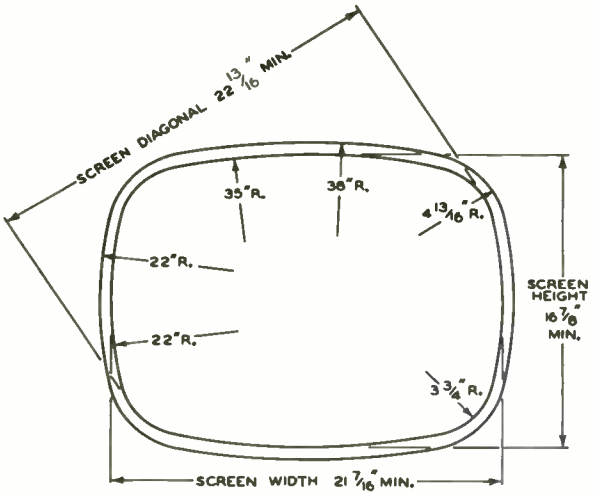
• Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 1/2-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

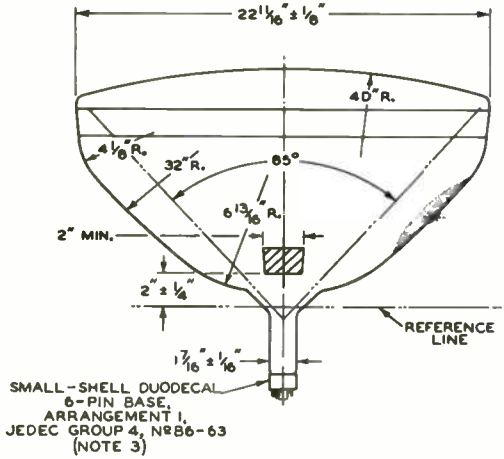
OPERATING CONSIDERATIONS

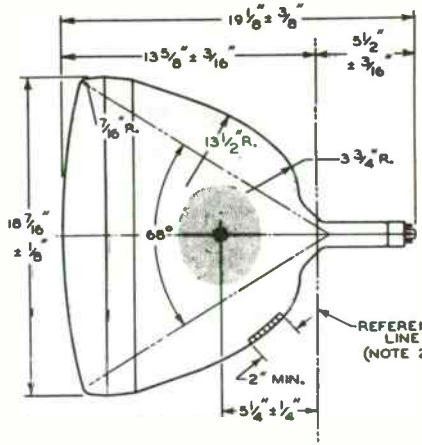
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 24ATP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

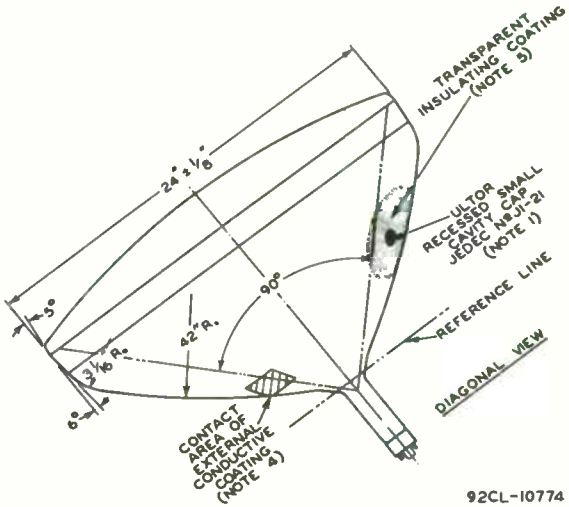
For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

24ATP4









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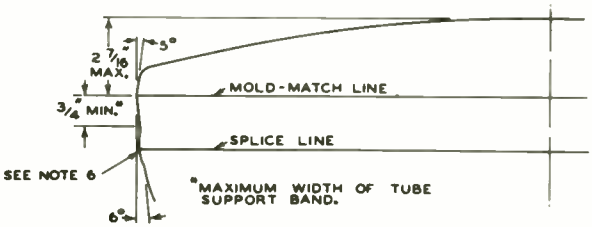


DETAIL OF PANEL

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.

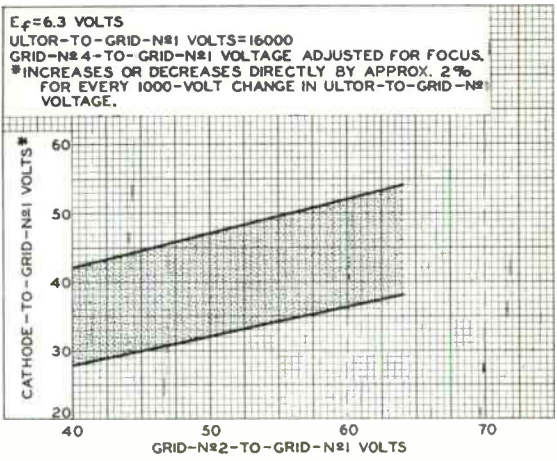
NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

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.

NOTE 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.

RASTER-CUTOFF-RANGE CHART
Cathode-Drive Service



92CS-10765

24AUP4
PICTURE TUBE

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	6.3	ac or dc volts
Current	0.6 ± 5%	amp
Warm-up time (Average)	11	sec
For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of Receiving Tube Section.		
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	2500 max. / 1700 min.	μμf
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		74%
Phosphor (For curves, see front of this Section)		P4—Sulfide Type Aluminized
Fluorescence		White
Phosphorescence		White
Persistence		Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		90°
Horizontal		85°
Vertical		68°
Electron Gun		Type Requiring No Ion-Trap Magnet
Tube Dimensions:		
Overall length		18-1/8" ± 3/8"
Greatest width		22-11/16" ± 1/8"
Greatest height		18-7/16" ± 1/8"
Diagonal		24" ± 1/8"
Neck length		4-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)		40"
Screen Dimensions (Minimum):		
Greatest width		21-7/16"
Greatest height		16-7/8"
Diagonal		22-13/16"
Projected area		332 sq. in.
Weight (Approx.)		32-1/2 lbs
Operating Position		Any
Cap		Recessed Small Cavity (JEDEC No.J1-21)
Bulb		J192A/B
Base		Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203), or Small-Shell Duodecal 6-Pin, Arrangement 1 (JEDEC Group 4, No.B6-63)

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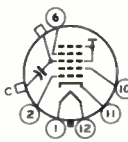
PICTURE TUBE

Basing 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



Cap – Ultor (Grid 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 Ratings, *Design-Center Values:*

ULTOR VOLTAGE	{20000 max. / 12000● min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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 voltage (E_{c_5k}) between 12000 and 20000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus§	−75 to +400 volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage
Grid-No.4 Current	−25 to +25 μa

▲,●,§: See next page.

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PICTURE TUBE

Grid-No.2 Current.	−15 to +15	μa
Field Strength of Adjustable Centering Magnet†.	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*18000*	*volts*
and grid-No.2 voltage of	*300*	*volts*
Grid-No.4 Voltage for focus . . .	−75 to +400	volts
Grid-No.1 Voltage for visual extinction of focused raster. .	−35 to −72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	35 to 72	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 Ratings, ***Design-Center Values:***

ULTOR-TO-GRID-No.1 VOLTAGE.	20000	max.	volts
	12000*	min.	volts
GRID-No.4-TO-GRID-No.1 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	140	max.	volts
Negative-bias value	0	max.	volts
Negative-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.	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.1 voltage (E_{c5g1}) between 12000 and 20000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 225 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§.	−75 to +400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	

▲, ●, §, †, ■: See next page.

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PICTURE TUBE

Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	Same value as determined for E_{kg1} except video drive is a negative voltage	
Grid-No.4 Current	−25 to +25	μa
Grid-No.2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet†	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	−75 to +400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	33 to 60	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): 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 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 11,000 volts, below which the serviceability of the 24AUP4 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 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-to-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 1/2-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.

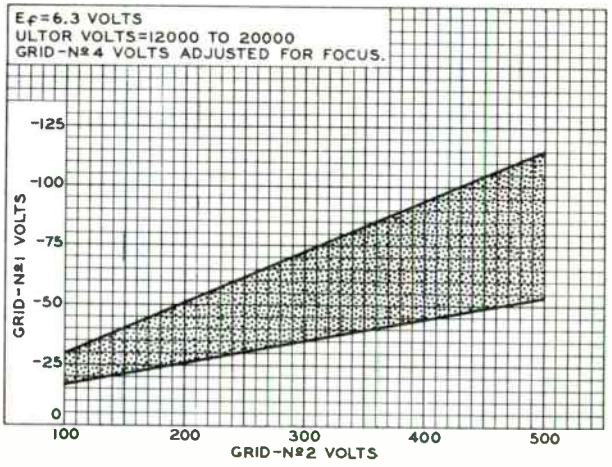
■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and other electrodes.

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

24AUP4

RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



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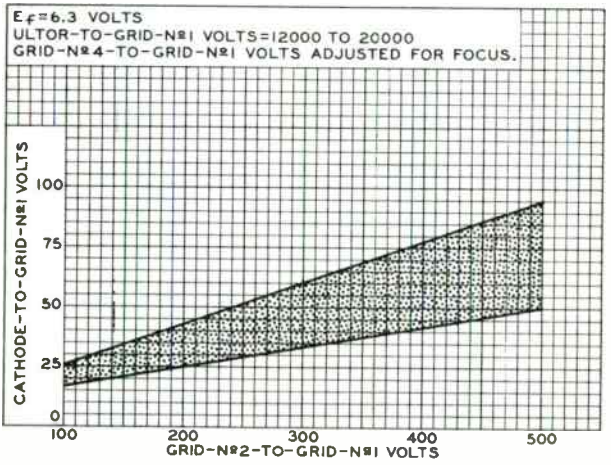
CATHODE-DRIVE SERVICE



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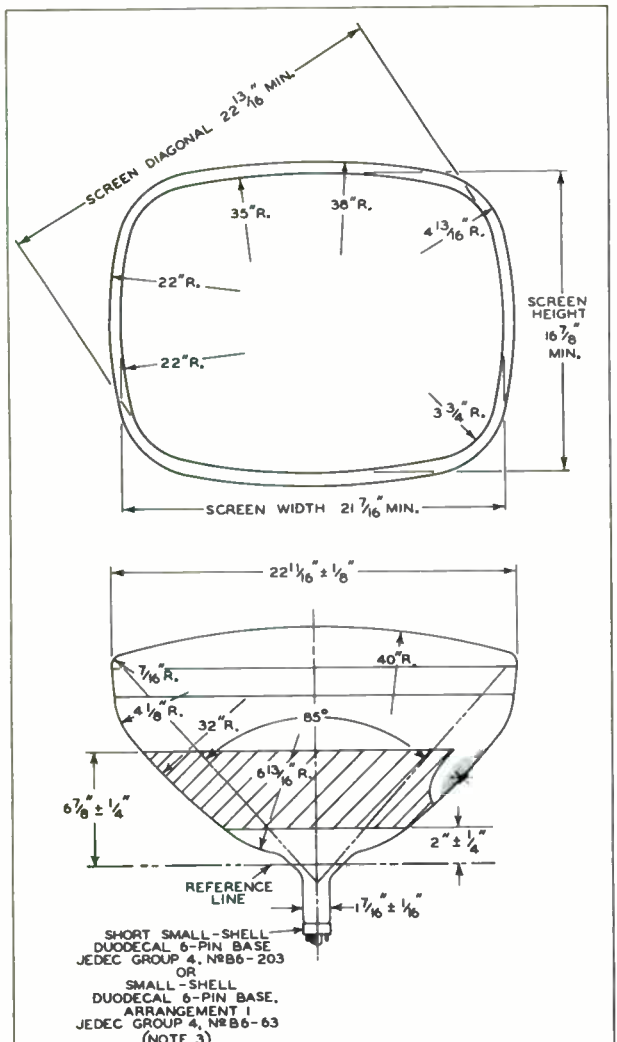
92CS-9918

24AUP4
PICTURE TUBE



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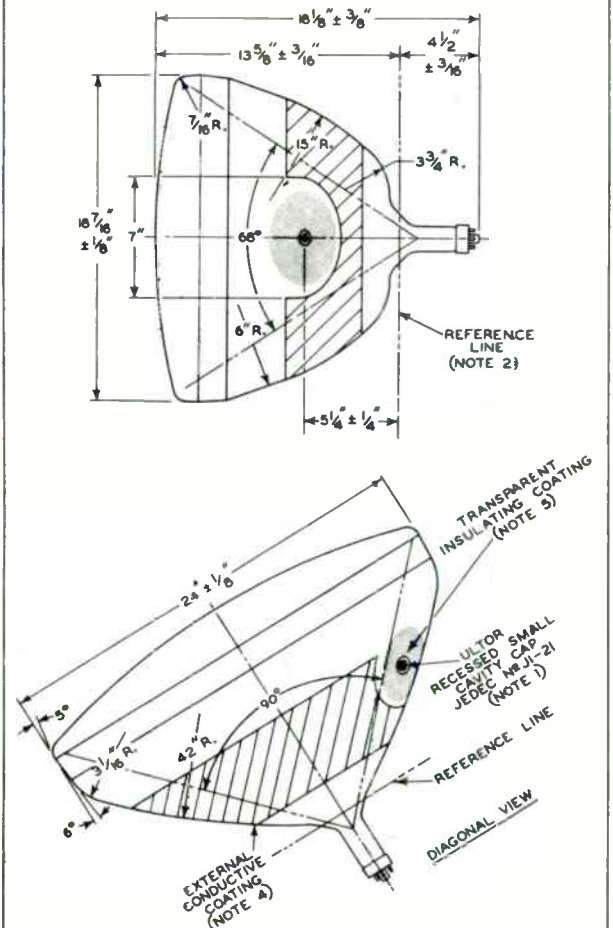
24AUP4

PICTURE TUBE



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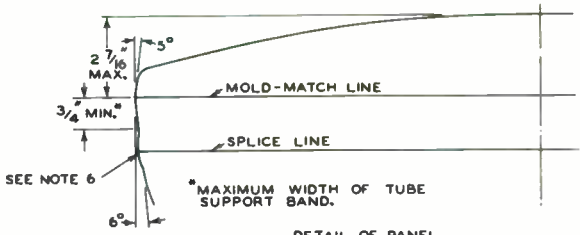
24AUP4

PICTURE TUBE



DETAIL OF PANEL

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 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.

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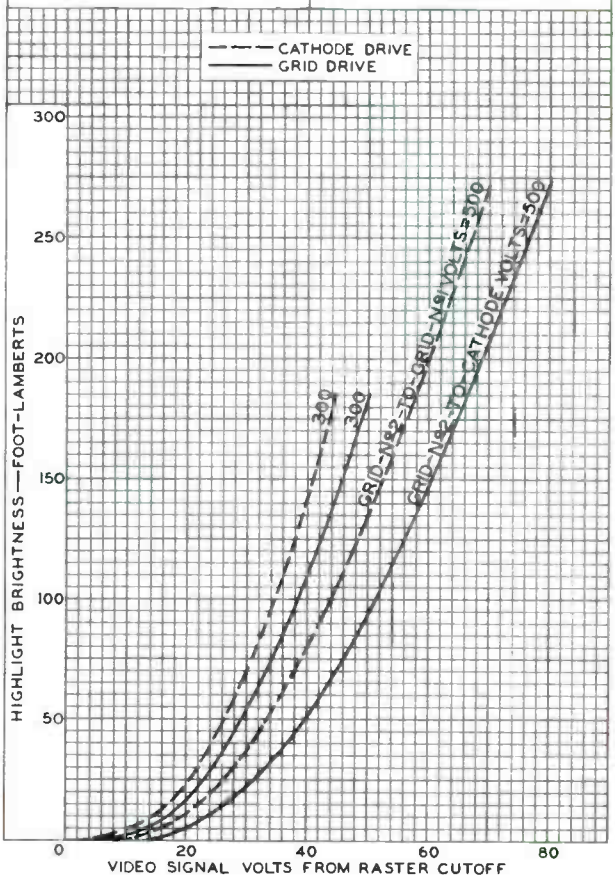
24AUP4

AVERAGE DRIVE CHARACTERISTICS

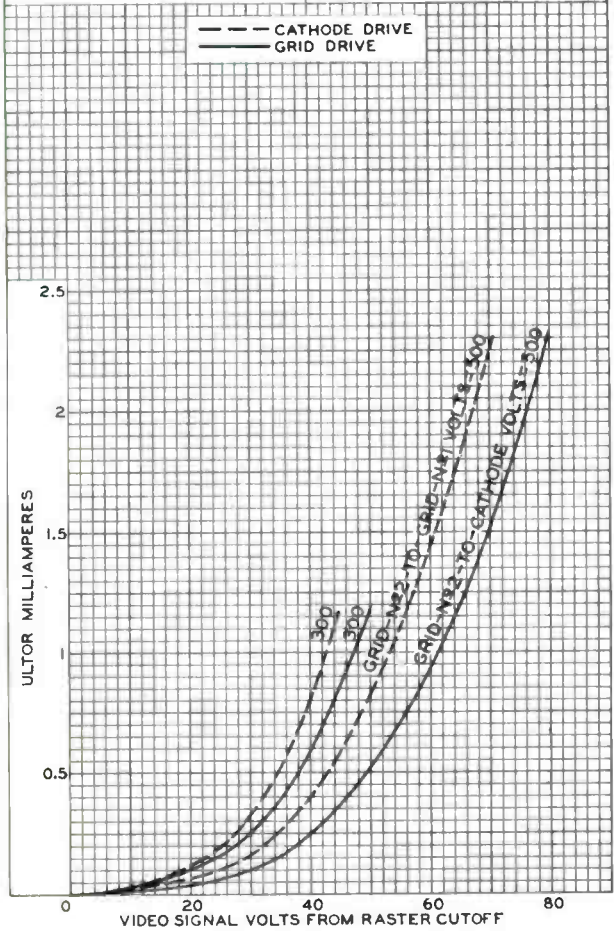
CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 21"x 16"	RASTER SIZE = 21"x 16"



24AUP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS = 12000 TO 20000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 6.3 VOLTS ULTOR VOLTS = 12000 TO 20000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



24BAP4
PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION
LOW GRID-No.2 VOLTAGE — CATHODE-DRIVE TYPE

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.6	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	2500 max. 1700 min.	μμf ←
Faceplate, Spherical	Filterglass	
Light transmission (Approx.)	76%	
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized	
Fluorescence	White	
Phosphorescence	White	
Persistence	Short	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	110°	
Horizontal	105°	
Vertical	87°	
Electron Gun	Type Requiring No Ion-Trap Magnet	
Tube Dimensions:		
Overall length	15-7/8" ± 5/16"	
Greatest width	22-11/16" ± 1/8"	
Greatest height	18-1/2" ± 1/8"	
Diagonal	24" ± 1/8"	
Neck length	5-7/16" ± 1/8"	
Radius of curvature of faceplate (External surface)	32"	
Screen Dimensions (Minimum):		
Greatest width	21-7/16"	
Greatest height	16-7/8"	
Diagonal	22-13/16"	
Projected area	332 sq. in.	
Weight (Approx.)	28 lbs	
Operating Position	Any	
Cap	Recessed Small Cavity (JEDEC No.J1-21)	
Bulb	J192 C1/D1	
Socket	Ucinite Part No.115446, or equivalent	
Base	Small-Button Eightar 7-Pin, Arrangement 2, (JEDEC No.B7-183)	

← Indicates a change.

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24BAP4

PICTURE TUBE

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

Cap – 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 Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No. 1 VOLTAGE.	{20000 max. / {12000● min.	volts / volts
GRID-No. 4-TO-GRID-No. 1 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:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	410 max.	volts
After equipment warm-up period. . . .	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No. 1 voltage ($E_{c_5g_1}$) between 12000 and 20000 volts and grid-No. 2-to-grid-No. 1 voltage ($E_{c_2g_1}$) between 40 and 64 volts

Grid-No. 4-to-Grid-No. 1 Voltage for focus§	0 to 400	volts
Cathode-to Grid-No. 1 Voltage (E_{kg_1}) 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 (Peak negative). . . .	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No. 4 Current.	−25 to +25	μa
Grid-No. 2 Current.	−15 to +15	μa
Field Strength of Adjustable Centering Magnet▲.	0 to 8	gauss

→ Indicates a change.

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24BAP4

PICTURE TUBE

Examples of Use of Design Ranges:			
With ultor-to-grid-No.1 voltage of	*16000*	*20000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*50*	*64*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus.	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	32 to 47	42 to 58	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value.	-32 to -47	-42 to -58	volts

Maximum Circuit Values:

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

● 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.

● This 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 24BAP4 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 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-to-grid-No.1 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 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.

OPERATING CONSIDERATIONS

X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, the 24BAP4 does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 22 kilovolts (Absolute-maximum value), shielding of the 24BAP4 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 shatter-proof, glass cover over the face of the 24BAP4 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.

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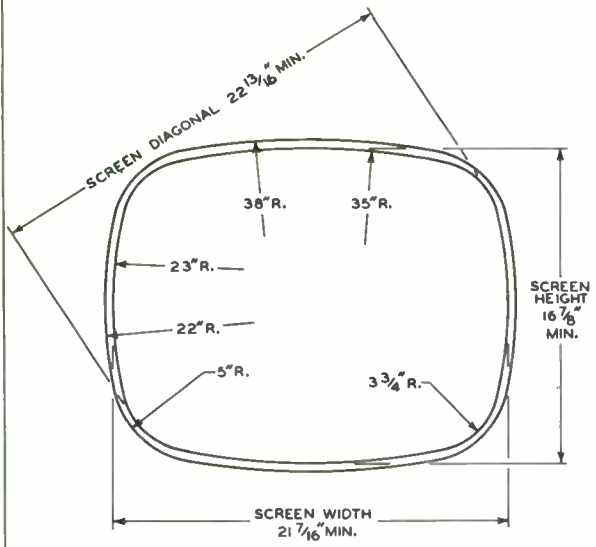
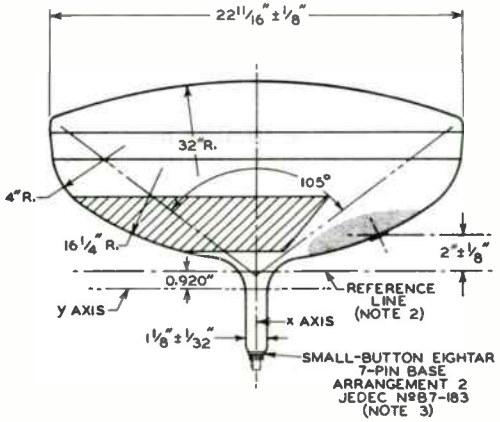
24BAP4

PICTURE TUBE





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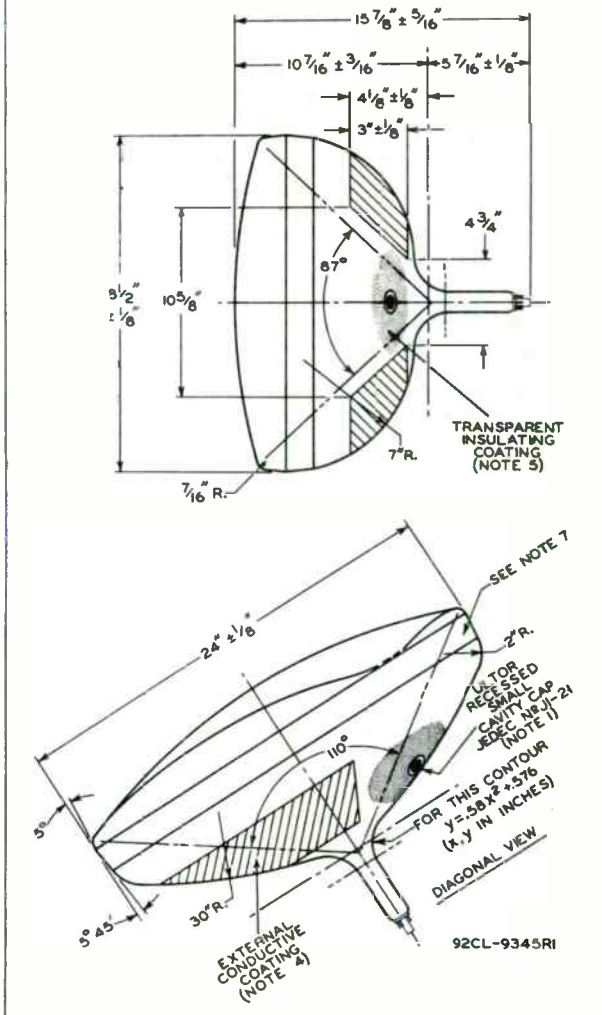
24BAP4

PICTURE TUBE



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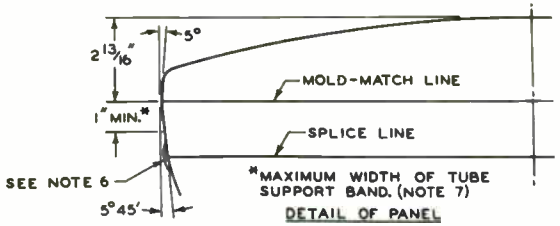
24BAP4

PICTURE TUBE



DETAIL OF PANEL

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 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, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 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.

NOTE 7: WIDTH OF UNDISTURBED REGION BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 1" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

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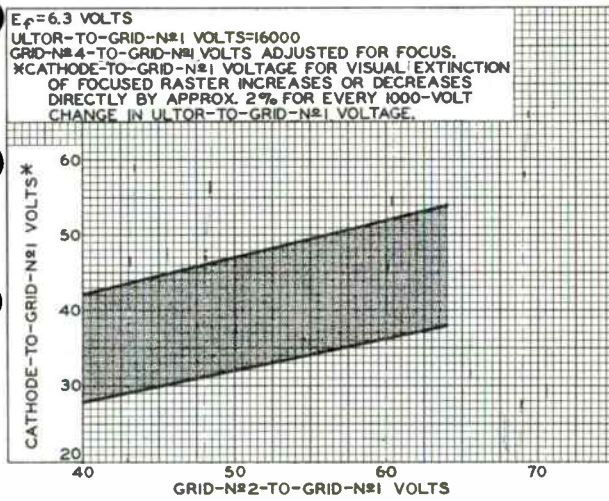
CE-9345R1C

24BAP4

RASTER-CUTOFF-RANGE CHART



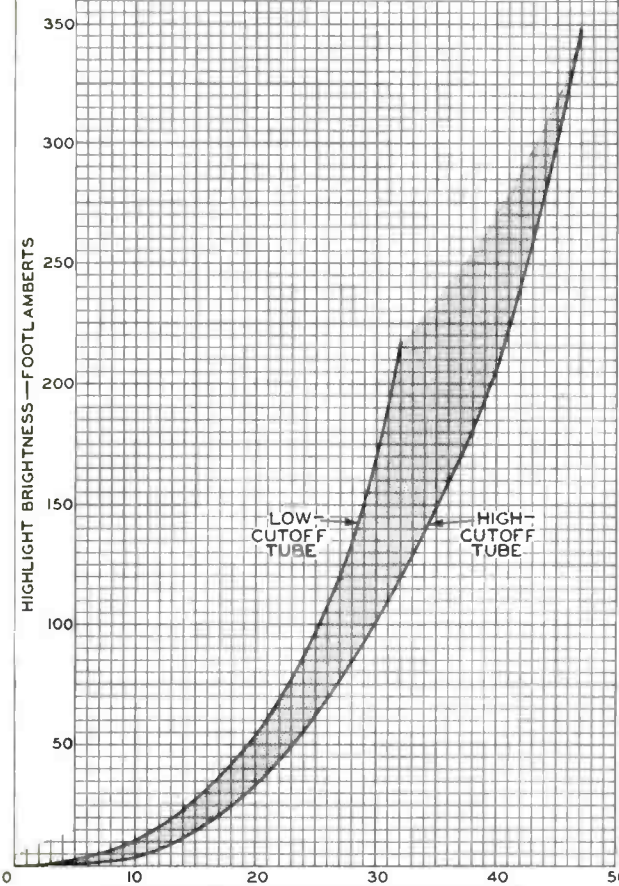
92CS-9945RI

24BAP4

CATHODE-DRIVE CHARACTERISTICS

E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000
GRID-№2-TO-GRID-№1 VOLTS = 50
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 21" x 16"

I.C.I. COORDINATES OF SCREEN: X = 0.270, Y = 0.300



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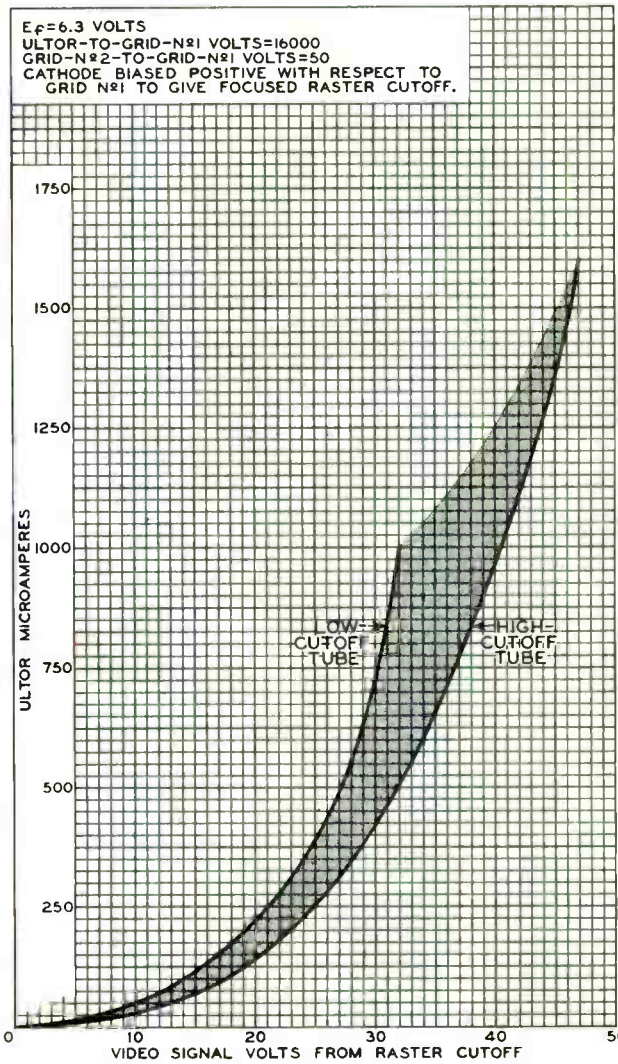
92CM-10075R1

RCA

24BAP4

CATHODE-DRIVE CHARACTERISTICS



Picture Tube

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
90° MAGNETIC DEFLECTION

Electrical:

Heater Current at 6.3 volts	600 ± 10% ma
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 2000 min. pf
Electron Gun	Type Requiring No Ion-Trap Magnet

Optical:

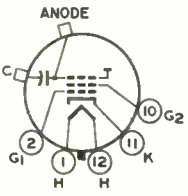
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	75%
Phosphor (For curves, see front of this section)	P4—Sulfide Type, Aluminized

Mechanical:

Operating Position	Any
Weight (Approx.)	35 lbs
Overall Length	21-1/8" ± 3/8"
Neck Length	7-1/2" ± 3/16"
Projected Area of Screen	332 sq. in.
External Conductive Coating:	
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 J192 A/B* sheets at the front of this section

Cap.	Recessed Small Cavity (JEDEC No.J1-21)
Base . . Small-Shell Duodecal 5-Pin (JEDEC Group 4, No.B5-57)	
Basing Designation for BOTTOM VIEW	12N



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

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

Maximum Ratings, *Design-Maximum Values:*

Anode Voltage	22000 max. volts
Grid-No.2 Voltage	550 max. volts

Grid-No.1 Voltage:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 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 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	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 raster	-28 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

24DP4-A/24YP4

PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 ± 10% . . . . . amp

Capacitance between External Conductive Coating and Ultor . . . . . { 2500 max. μμf / 2000 min. μμf

Faceplate, Spherical . . . . . Filterglass

Phosphor (For Curves, see front of this Section) . . P4—Sulfide Type Aluminized

Deflection Angles (Approx.):
- Diagonal . . . . . 90°
- Horizontal . . . . . 85°
- Vertical . . . . . 68°

Electron Gun . . . . . Ion-Trap Type Requiring External Single-Field Magnet

Tube Dimensions:
- Overall length . . . . . 21-1/8" ± 3/8"
- Greatest width . . . . . 22-11/16" ± 1/8"
- Greatest height . . . . . 18-7/16" ± 1/8"
- Diagonal . . . . . 24" ± 1/8"
- Neck length . . . . . 7-1/2" ± 3/16"
- Radius of curvature of faceplate (External surface) . . 40"

Screen Dimensions (Minimum):
- Greatest width . . . . . 21-7/16"
- Greatest height . . . . . 16-7/8"
- Diagonal . . . . . 22-13/16" ←
- Projected area . . . . . 332 sq. in.

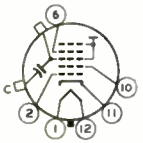
Operating Position . . . . . Any

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

Base . . Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-63) ←

Basing 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



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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	20000 max. volts
GRID-No.4 (FOCUSING) VOLTAGE:	
Positive value	1000 max. volts
Negative value	500 max. volts
GRID-No.2 VOLTAGE	500 max. volts

← Indicates a change.

ELECTRON TUBE DIVISION
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24DP4-A/24YP4

PICTURE TUBE

GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 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 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

27EP4

PICTURE TUBE

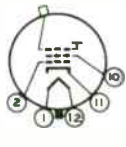
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage (AC or DC)	6.3 volts
Current	0.6 ± 10% amp
Faceplate, Spherical	Filterglass
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized
Deflection Angles (Approx.):	
Diagonal	90°
Horizontal	85°
Vertical	69°
Electron Gun	Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:	
Overall length	23-1/16" ± 3/8"
Greatest width	25-9/32" ± 3/16"
Greatest height	20-7/32" ± 3/16"
Diagonal	26-13/16" ± 3/16"
Neck length	7-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)	40"
Screen Dimensions (Minimum):	
Greatest width	24-1/4"
Greatest height	18-5/8"
Diagonal	25-3/4"
Projected area	425 sq. in.
Operating Position	Any
Cap	Recessed Small Cavity (JEDEC No. J1-21)
Base	Small-Shell Duodecal 5-Pin (JEDEC Group 4, No. B5-57)
Basing Designation for BOTTOM VIEW	12D

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



Pin 12 - Heater
Cap - Ultor (Grid No.3, Collector)

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

ULTOR VOLTAGE	20000 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	200 max.	volts
Negative-bias value	140 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

RCA

27EP4

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

27MP4

PICTURE TUBE

RECTANGULAR METAL-SHELL TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . . 6.3 . . . . . ac or dc volts
- Current . . . . . 0.6 ± 10% . . . . . amp ←

Faceplate, Compound Spherical . . . . . Frosted Filterglass ←
Phosphor (For Curves, see front of this Section) . . P4—Sulfide Type Aluminized

Deflection Angles (Approx.):
- Diagonal . . . . . 90°
- Horizontal . . . . . 85°
- Vertical . . . . . 69°

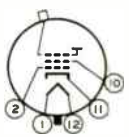
Electron Gun . . . . . Ion-Trap Type Requiring External Single-Field Magnet

Tube Dimensions:
- Maximum overall length . . . . . 22-3/16"
- Greatest width at lip . . . . . 25-1/4" ± 3/16"
- Greatest height at lip . . . . . 19-15/16" ± 3/16"
- Diagonal at lip . . . . . 26-7/8" ± 1/4"
- Neck length . . . . . 7-1/2" ± 3/16"
- Radius of curvature of faceplate (External surface) . . . . ◆

Screen Dimensions (Minimum):
- Greatest width . . . . . 23-7/16"
- Greatest height . . . . . 18-1/8"
- Diagonal . . . . . 25-1/16"

Operating Position . . . . . Any
Ultor Terminal . . . . . Metal-Shell Lip
Base . . Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57) ←
Basing Designation for BOTTOM VIEW . . . . . 12D ←

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 Ratings, *Design-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

◆: See next page.

← Indicates a change.

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27MP4

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

♦ Within major area, the radius of curvature is 40". 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 — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **90° MAGNETIC DEFLECTION**

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600	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	2500 max. / 2000 min.	μμf
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

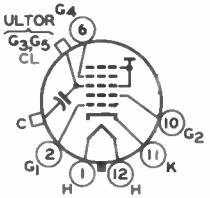
Faceplate	Filterglass
Light transmission (Approx.)	72%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type, Aluminized

Mechanical:

Operating Position	Any
Weight (Approx.)	44 lbs
Overall Length	21-1/16" ± 3/8"
Neck Length	5-1/2" ± 3/16"
Projected Area of Screen	425 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 J214-1/2 A* sheets at the front of this section

Cap	Recessed Small Cavity (JEDEC No.J1-21)
Base	Small-Shell Duodecal 6-Pin, Arrangement 1 (JEDEC Group 4, No.B6-63)
Basing 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

Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

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 peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 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 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with 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	-72 to +396	volts
Grid-No.1 Voltage for visual extinction of focused raster	-28 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

27XP4

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **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)	11	seconds
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	95°	
Horizontal	85°	
Vertical	68°	
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor.	2500 max. 1700 min.	μμf μμf
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

Faceplate, Spherical	Filterglass
Light transmission at center (Approx.)	72%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Medium Short

Mechanical:

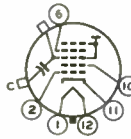
Tube Dimensions:	
Overall length	20-1/16" ± 3/8"
Greatest width	25-9/32" ± 1/8"
Greatest height	20-7/32" ± 1/8"
Diagonal	26-13/16" ± 1/8"
Neck length	4-1/2" ± 3/16"
Curvature of faceplate (External Radius):	
Center	40"
Screen Dimensions (Minimum):	
Greatest width	24-1/4"
Greatest height	18-5/8"
Diagonal	25-3/4"
Projected area	425 sq. in.
Weight (Approx.)	44 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Bulb	J214-1/2A2

27XP4

Base. . . . . .Short Small-Shell Duodecal 6-Pin
(JEDEC Group 4, No.B6-203)

Basing 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



Cap – Ultor
(Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

GRID-DRIVE[a] SERVICE

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

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

ULTOR VOLTAGE	23000 max. 11000 min.	volts volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max. 200 min.	volts volts
GRID-No.1 VOLTAGE:		
Negative-peak value	220 max.	volts
Negative-bias value	154 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor voltage (E_{c_3k}) of	*18000*	*volts*
and grid-No.2 voltage (E_{c_2k}) of	*400*	*volts*
Grid-No.4 Voltage for focus[b]	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster[c]	-36 to -94	volts
Field Strength of Adjustable Centering Magnet[d]	0 to 11	gausses

Maximum Circuit Values:

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

CATHODE-DRIVE[a] 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	23000 max. 11000 min.	volts volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	1250 max.	volts
Negative value	400 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	700 max. 350 min.	volts volts
GRID-No.2-TO-CATHODE VOLTAGE	550 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	6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) of	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) of	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus[b]	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster[f]	36 to 78	volts
Field Strergth of Adjustable Centering Magnet[d]	0 to 11	gausses

Maximum Circuit Values:

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

[a] Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

[b] The grid-No.4 (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.

[c] See *Raster-Cutoff-Range Chart for Grid-Drive Service.*

[d] 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:

$$\sqrt{\frac{E_{c_5k} \text{ or } E_{c_{5g_1}} \text{ (volts)}}{16000 \text{ (volts)}}} \times 11 \text{ gauss}$$

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.

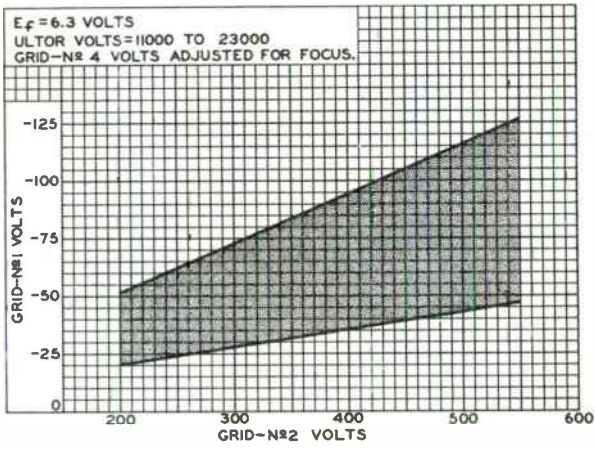
f See *Raster-Cutoff-Range Chart for Cathode-Drive Service.*

OPERATING CONSIDERATIONS

X-Ray Warning. When operated at ultor voltages up to 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 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.

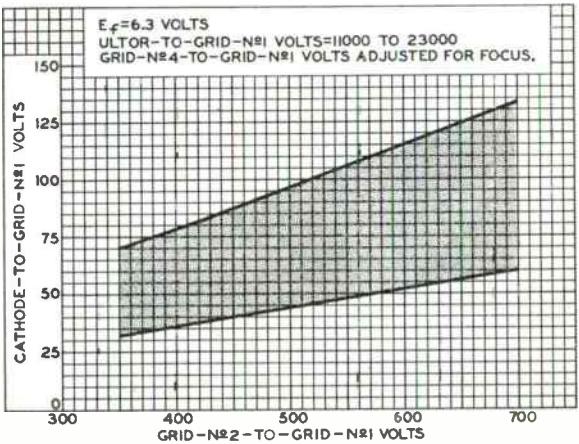
Shatter-Proof Cover Over the Tube Face. Following conventional picture tube practice, it is recommended that the cabinet be provided with a shatterproof, glass cover over the face of this picture tube to protect it from being struck accidentally and to protect against possible damage resulting from tube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

RASTER-CUTOFF-RANGE CHARTS
Grid-Drive Service



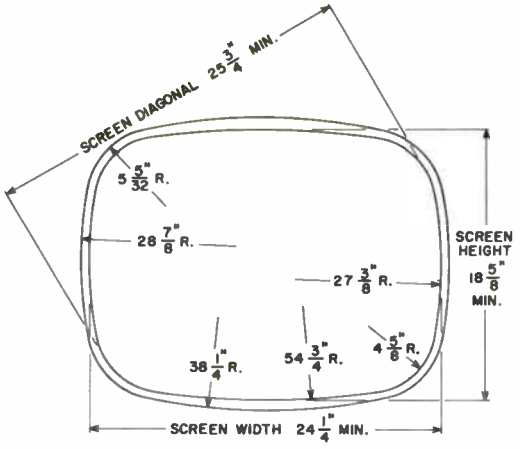
92CS-10912

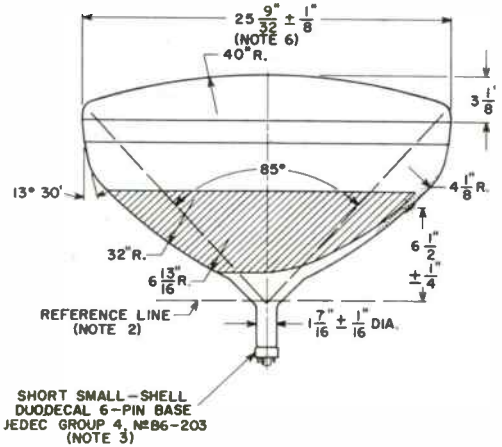
Cathode-Drive Service

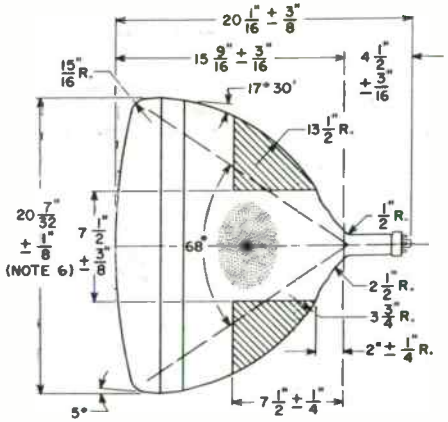


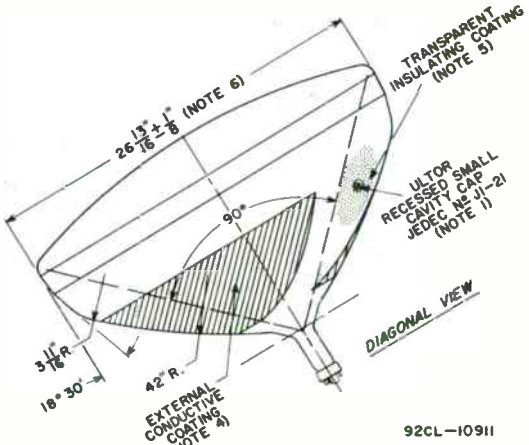
92CS-10904

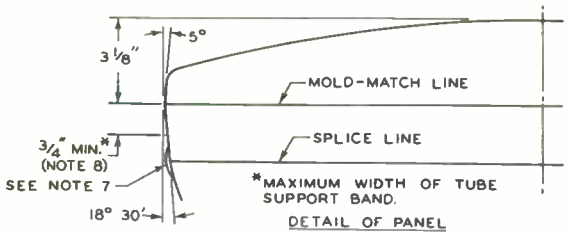
27XP4











DETAIL OF PANEL

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 LINTLESS 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 LOCATION SPECIFIED FOR DIMENSIONING 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 902

General:

Heater, for Unipotential Cathode:		
Voltage	6.3 ± 10%	ac or dc volts
Current	0.6	amp.
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to All Other Electrodes	7.5	μμf
DJ_1 to All Other Electrodes	8.5	μμf
DJ_4 to All Other Electrodes	6.0	μμf
Phosphor (For Curves, see front of this Section)		No.1
Fluorescence		Green
Persistence		Medium
Focusing Method		Electrostatic
Deflection Method		Electrostatic
Overall Length		7-7/16" ± 3/16"
Greatest Diameter of Bulb		2" ± 1/16"
Minimum Useful Screen Diameter		1-3/4"
Mounting Position		Any
Base		Medium Shell Octal 8-Pin
Basing Designation for BOTTOM VIEW		8CD

Pin 1 - Grid No.2, Anode No.2, Deflecting Electrode DJ_2, Deflecting Electrode DJ_3,
Pin 2 - Heater, Cathode

Pin 3 - Anode No.1
Pin 4 - Deflecting Electr. DJ_1
Pin 5 - Grid No.1
Pin 6 - Deflecting Electr. DJ_4
Pin 7 - Heater
Pin 8 - No Connection

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 is deflected toward pin 3. With DJ_3 positive with respect to DJ_4, the spot is deflected toward pin 1.

The angle between the trace produced by DJ_3 and DJ_4 and its intersection with the plane through the tube axis and pin 1 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° ± 4°.

Maximum Ratings, *Absolute Values*:

ANODE-No.2 & GRID No.2 VOLTAGE	660 *max.*	volts
ANODE-No.1 VOLTAGE	330 *max.*	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative Value	125 *max.*	volts
Positive Value	0 *max.*	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND DEFLECTING ELECTRODE DJ_1 OR DJ_4	385 *max.*	volts

RCA

902-A

HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

Typical Operation:

Anode No.2 & Grid No.2 Voltage★	400	600	volts
Anode No.1 Voltage for Focus at 75% of Grid-No.1 Voltage for Cutoff ●	100	150	volts
Grid-No.1 Volt. for Visual Cutoff♯	−40	−60	volts
Max. Anode-No.1 Current Range▲	Between −50 and +10		μamp.
Deflection Sensitivity:			
DJ_1 and DJ_2	0.273	0.183	mm/v dc
DJ_3 and DJ_4	0.326	0.217	mm/v dc
Deflection Factor:**			
DJ_1 and DJ_2	93	139	v dc/in.
DJ_3 and DJ_4	78	117	v dc/in.

★ 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.

♯ 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 10-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ_1 and DJ_2. Suitable test conditions are: anode-No.2 voltage, 600 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 megohm each for DJ_3 and DJ_4, 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

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

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

Display-Storage Tube

"RUGGEDIZED" TYPE
ONE WRITING GUN
ONE VIEWING GUN

5" - DIAMETER BULB
308" - DIAMETER DISPLAY
INTEGRAL MAGNETIC SHIELD

For Military and Commercial Information-Handling Displays Where Tube May Be Subjected to Severe Environmental Conditions

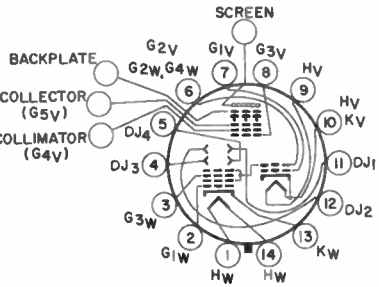
DATA

General:

	Writing Section	*Viewing Section*	
Heater, for Unipotential Cathode:			
Voltage (AC or DC)	6.3 ± 5%	6.3 ± 5%	volts
Current at 6.3 volts	0.6	0.6	amp
Cathode Heating Time (Minimum) before other electrode voltages are applied	–	60	sec
Direct Interelectrode Capacitances:			
Grid No.1 to all other electrodes	6.5	11	pf
Cathode to all other electrodes	5.5	8	pf
Backplate to all other electrodes		116	pf
Deflecting electrode DJ1 to deflecting electrode DJ2		1.9	pf
Deflecting electrode DJ3 to deflecting electrode DJ4		2	pf
DJ1 to all other electrodes		6	pf
DJ2 to all other electrodes		7	pf
DJ3 to all other electrodes		5	pf
DJ4 to all other electrodes		4.8	pf
Focusing Method		Electrostatic	
Deflection Method		Electrostatic	
Deflecting-Electrode Arrangement		See *Dimensional Outline*	
Phosphor		P20, Aluminized	
Minimum Useful Viewing Diameter[a]		3.8"	
Maximum Overall Length (Excluding encapsulated screen lead)		13.64"	
Maximum Seated Length		12.89"	
Maximum Diameter (Excluding encapsulated screen lead)		5.562"	
Operating Position		Any	
Weight (Approx.)		5-1/2 lbs	
Base		Medium-Shell Diheptal 14-Pin (JEDEC Group 5, No.B14-38)	

2053

BOTTOM VIEW



Pin 1 – Heater of the writing gun
Pin 2 – Grid No.1 of the writing gun
Pin 3 – Grid No.3 of the writing gun
Pin 4 – Deflecting electrode DJ3 of the writing gun
Pin 5 – Deflecting electrode DJ4 of the writing gun
Pin 6 – Grid No.2 of the viewing gun, Grid No.2 and Grid No.4 of the writing gun
Pin 7 – Grid No.1 of the viewing gun
Pin 8 – Grid No.3 of the viewing gun
Pin 9 – Heater of the viewing gun
Pin 10 – Heater and cathode of the viewing gun
Pin 11 – Deflecting electrode DJ1 of the writing gun
Pin 12 – Deflecting electrode DJ2 of the writing gun
Pin 13 – Cathode of the writing gun
Pin 14 – Heater of the writing gun

Leads:
At tube base—
Collector (Grid No.5 of viewing gun)—red wire
Collimator (Grid No.4 of viewing gun)—green wire
Backplate—violet wire
Encapsulated Lead: Screen Connector

Maximum and Minimum Ratings, ***Absolute-Maximum Values:***

All voltages are shown with respect to the cathode of the viewing gun unless otherwise specified.

	Minimum	*Maximum*	
Screen Voltage:			
Peak	0	11000	volts
DC	0	10500	volts
Backplate Voltage:			
Peak	0	15	volts
DC	−30	10	volts
Collector (Viewing-Grid-No.5) Voltage	130	170	volts

	Minimum	Maximum	
Collimator (Viewing-Grid No.4) Voltage	0	100	volts
Viewing-Grid-No.3 Voltage	10	50	volts
Viewing-Grid-No.2, Writing-Grid-No.4, and Writing-Grid-No.2 Voltage[b]	115	135	volts
Viewing-Grid-No.1 Voltage	-200	0	volts
Viewing-Gun Heater-to-Cathode Voltage	-125	125	volts
Magnetic-Shield Voltage[a]	-200	200	volts
Writing-Grid-No.4, Writing-Grid-No.2-to-any Deflecting Electrode Voltage[b]	-500	500	volts
Writing-Grid-No.3 Voltage[c]	0	1200	volts
Writing-Grid-No.1 Voltage[c]	-200	e	volts
Writing-Gun Cathode Voltage	-2750	145	volts
Writing-Gun Heater-to-Cathode Voltage	-125	125	volts
Series Current-Limiting Resistor (Unbypassed) in Screen Circuit	1	-	megohm
Series Current-Limiting Resistor (Unbypassed) in Collector (Viewing-Grid-No.5) Circuit	0.005	-	megohm

Recommended Operating Values:

All voltages are shown with respect to the cathode of the viewing gun unless otherwise specified.

Screen Voltage	10000	volts
Backplate Voltage	2	volts
Collector (Viewing-Grid-No.5) Voltage	150	volts
Collimator (Viewing-Grid-No.4) Voltage[e]	20 to 90	volts
Viewing-Grid-No.3 Voltage[e]	10 to 40	volts
Viewing-Grid-No.2 Voltage[b]	125	volts
Viewing-Grid-No.1 Voltage[e]	-60 to 0	volts
Viewing-Gun Cathode	At ground potential	
Magnetic Shield[f]	At ground potential	
Writing-Grid-No.3 Voltage[g]	-1650 to -1250	volts
Writing-Grid-No.1 Voltage	d,h	volts
Writing-Gun Cathode	-2000	volts
Average Deflecting Plate Voltage	112	volts
Circuit Values:		
Grid-No.1 Circuit Resistance (either gun)	1 max.	megohm
Resistance in any Deflecting Electrode Circuit[j]	0.01 max.	megohm
Backplate-Circuit Resistance	0.005 max.	megohm
Series Current-Limiting Resistor (Unbypassed) in Screen Circuit	1	megohm
Series Current-Limiting Resistor (Unbypassed) in Collector (Viewing Grid-No.5) Circuit	0.005	megohm

Performance Data and Characteristics:

	Min.	Typ.	Max.	
Useful Viewing Diameter[a]	3.8	–	–	inches
Luminance (Brightness)[k]	1000	1900	–	footlamberts
Viewing Duration[m]	20	–	–	seconds
Erasing Time[m]	8	–	50	milliseconds
Undeflected Spot Position[n]	–	–	10	millimeters
Deflection Factors:				
DJ1 & DJ2	72	81	90	volts/inch
DJ3 & DJ4	70	82	90	volts/inch

Environmental Tests:

The 2053 is designed to withstand the following environmental tests:

Vibration parallel to each of the three orthogonal axes and as specified in the schedule below. Two concurrent survey cycles each having a duration of 15 minutes are taken for each axis. The frequency is first changed from 5 to 54 and back to 5 cycles per second and then from 54 to 500 and back to 54 cycles per second. The frequencies of all resonant points are noted.

Double Amplitude in inches	Acceleration in g's	Frequency in cps	Sweep Duration in minutes (Approx.)
0.080	–	5 to 54	7.5
0.080	–	54 to 5	7.5
–	8	54 to 80	1.5
–	2	80 to 500	6.0
–	2	500 to 80	6.0
–	8	80 to 54	1.5

Resonance for one minute at the resonant point determined in *Vibration* for which resonance is most severe. If no resonant points are observed in *Vibration*, the 2053 is vibrated for one minute at a frequency of 50 cycles per second.

Shock — Non-Destructive consisting of three impact shocks in both directions of the three orthogonal axes. Each impact shock has a peak acceleration of 15 g's and a time duration of 11 milliseconds.

Shock — Destructive consisting of three impact shocks in both directions of the three orthogonal axes. Each impact shock has a peak acceleration of 30 g's and a time duration of 11 milliseconds. Following this destructive shock test, the tube need not be operable and any degree of internal destruction is permissible. However, no destruction or cracking of the tube faceplate is permitted and all internal parts must remain within the magnetic shield.

Fatigue consisting of vibration for 32 hours in each of the three orthogonal axes. A vibration frequency of 25 cps is employed with an amplitude of 0.040" (total excursion 0.080"). Each tube is vibrated for a total of 96 hours.

[a] The minimum useful viewing area may not be concentric with respect to the tube face.

[b] Grids No.4 and No.2 of Writing Gun and 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] Adjusted for brightest, most uniform, full-size pattern.

[f] The integral magnetic shield should be grounded to eliminate shock hazard.

[g] Adjusted for the smallest, most circular spot.

[h] The bias-voltage value for writing-beam cutoff is between -54 and -92 volts with respect to writing-gun cathode.

[j] 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 resistance 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.

[k] Luminance (Brightness) is measured after the entire display is written to saturated brightness, the writing gun has been turned off, and with no erasing pulse applied.

[m] The time required for any 1.5-inch diameter area of the useful 3.8-inch diameter viewing area to spontaneously rise (with no writing or erasing) from zero brightness (viewing-beam cutoff) to 10% of saturated brightness.

[n] Apply a single pulse having an amplitude of 9 volts to the backplate. Erasing time is defined as the shortest duration of such a pulse that will completely erase a full 3.8-inch diameter area display.

[p] The undeflected spot position must fall within a circle having a 5/16-inch radius (maximum), 0.2-inch from the geometric center of the tube face, on the radius passing through the center of the screen terminal.

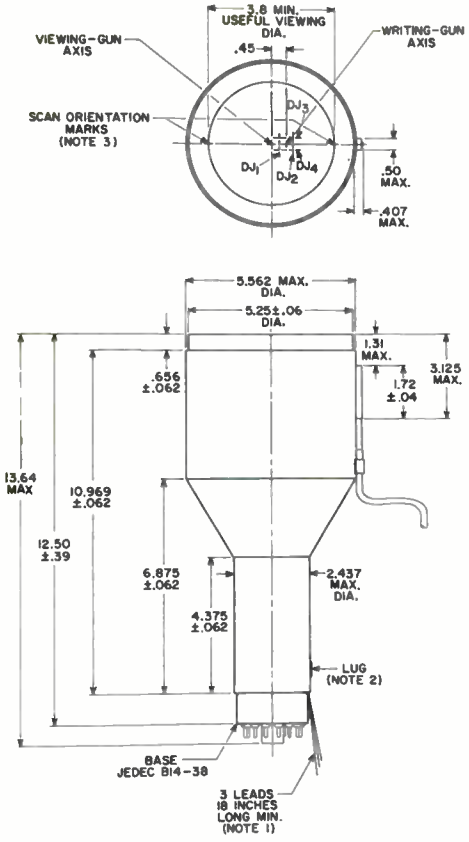
[q] The magnetic shield is normally connected to the viewing-gun cathode which is at ground potential.

OPERATING CONSIDERATIONS

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.

FOR ADDITIONAL INFORMATION ON THIS TYPE, WRITE FOR TECHNICAL BULLETIN AND PUBLICATION ICE-277, "RCA DISPLAY-STORAGE TUBES" AVAILABLE FROM:

Commercial Engineering
Electronic Components and Devices
Radio Corporation of America
Harrison, New Jersey



DIMENSIONS IN INCHES

NOTE 1: RED LEAD IS FOR CONNECTION TO COLLECTOR (VIEWING GRID No.5); GREEN LEAD IS FOR CONNECTION TO COLLIMATOR (VIEWING GRID No.4); VIOLET LEAD IS FOR CONNECTION TO BACKPLATE.

NOTE 2: SOLDER LUG FOR GROUNDING MAGNETIC SHIELD.

NOTE 3: SCAN ORIENTATION MARKS ARE PARALLEL TO TRACE PRODUCED BY DEFLECTING PLATES DJ1 AND DJ2.

Oscillograph-Type Cathode-Ray Tube

ELECTROSTATIC DEFLECTION 5-in DIAMETER ELECTROSTATIC FOCUS

For General Oscillographic Applications in which Recurrent-Wave Phenomena are to be Observed

ELECTRICAL

Heater Current at 6.3 V	0.6	A
Direct Interelectrode Capacitances (Approx.)		
Grid-No.1 to all other electrodes	10	pF
Cathode to all other electrodes	5.5	pF
DJ1 to DJ2	2.5	pF
DJ3 to DJ4	3.0	pF
DJ1 to all other electrodes	10.5	pF
DJ2 to all other electrodes	8.5	pF
DJ3 to all other electrodes	8.5	pF
DJ4 to all other electrodes	9.5	pF
Focusing Method	Electrostatic	
Deflection Method	Electrostatic	

OPTICAL

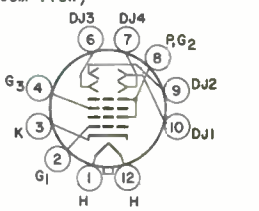
Phosphor	P1
Fluorescence and phosphorescence	Yellowish-Green
Persistence	Medium
Faceplate	Clear Glass
Shape	Flat, Circular
Minimum Useful Screen Diameter	4.56 in

MECHANICAL

Operating Position	Any
Weight	2 lb
Overall Length	12.000 ± 0.125 in
Greatest Diameter	5.25 ± 0.06 in
Bulb	J42 Dev.66
Base	Special, Small-Shell Duodecal, 10-pin

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Heater
Pin 2 – Grid No.1
Pin 3 – Cathode
Pin 4 – Grid No.3
Pin 6 – Deflecting Electrode DJ3
Pin 7 – Deflecting Electrode DJ4
Pin 8 – Anode, Grid No.2
Pin 9 – Deflecting Electrode DJ2
Pin 10 – Deflecting Electrode DJ1
Pin 12 – Heater



ABSOLUTE-MAXIMUM AND MINIMUM RATINGS

Anode Voltage	2800 max	V
Grid-No.3 (Focusing-Electrode) Voltage	1100 max	V
Grid-No.1 Voltage		
Negative bias value	200 max	V
Positive bias value	0 max	V
Positive peak value	2 max	V

Heater Voltage	6.9 max 5.7 min	V V
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

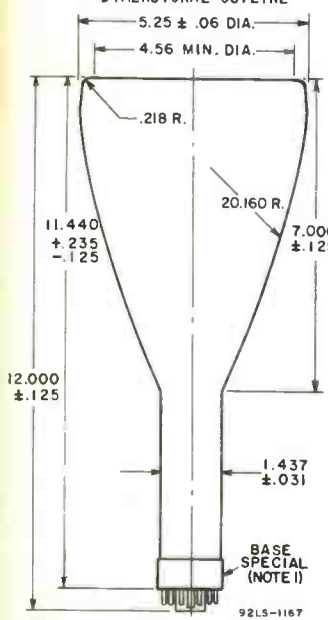
Anode Voltage	2200	V
Grid-No.3 (Focusing-Electrode) Voltage	750 to 1000	V
Grid-No.1 Voltage	-60 to -140	V
For visual cutoff of focused spot		
Deflection Factors		
DJ1 and DJ2	84 to 106	V (dc)/in
DJ3 and DJ4	67 to 83	V (dc)/in

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance	1.5 max	MΩ
Resistance in any Deflection Electrode Circuit[a]	5 max	MΩ

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

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

The plane through the tube axis and pin 4 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 4; 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. 5 and pin No. 11 are omitted.

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Electronic Components and Devices
Harrison, N. J.

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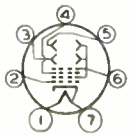
OSCILLOGRAPH TUBE

Supersedes Type 908

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
DJ_1 to All Other Electrodes	8.5	μμf
DJ_3 to All Other Electrodes	6.5	μμf
Phosphor (For Curves, see front of this Section)		No.5
Fluorescence		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 DJ_3
Pin 4 – Anode No.1
Pin 5 – Deflecting Electrode DJ_1



Pin 6 – Grid No.2, Anode No.2, Deflecting Electr. DJ_2, Deflecting Electr. DJ_4
Pin 7 – Heater, Cathode

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

With DJ_2 positive with respect to DJ_1, the spot is deflected toward pin 1. With DJ_4 positive with respect to DJ_3, the spot is deflected toward pin 6.

The angle between the trace produced by DJ_3 and DJ_4 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° ± 3°.

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	125 *max.*	volts
Positive Value	0 *max.*	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND DEFLECTING ELECTRODE DJ_1 OR DJ_3	500 *max.*	volts

RCA

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OSCILLOGRAPH TUBE

(continued from preceding page)

Typical Operation:

Anode No.2 & Grid No.2 Voltage* . .	1000	1500 . . .	volts
Anode No.1 Voltage for Focus at 75% of Grid-No.1 Voltage for Cutoff● . .	287	430 . . .	volts
Grid-No.1 Volt. for Visual Cutoff#.	-33	-50 . . .	volts
Max. Anode-No.1 Current Range▲. Between -50 and +10			μamp.
Deflection Sensitivity:			
DJ_1 and DJ_2	0.334	0.223 . .	mm/v dc
DJ_3 and DJ_4	0.348	0.233 . .	mm/v dc
Deflection Factor:**			
DJ_1 and DJ_2	76	114 . .	v dc/in.
DJ_3 and DJ_4	73	109 . .	v dc/in.

* 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_1 and DJ_2. Suitable test conditions are: anode-No.2 voltage, 1500 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 megohm each for DJ_1 and DJ_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▲▲	5.0 *max.*	megohms

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

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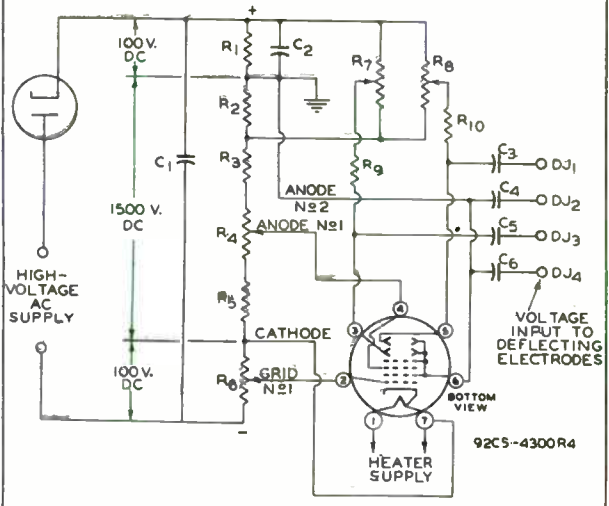
OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.1 μf
C2: 1.0 μf
C3 C4 C5 C6: 0.05-μf Blocking Capacitors*
R1 R2: 1.5 Megohms
R3: 4 Megohms
R4: 2-Megohm Potentiometer
R5: 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.

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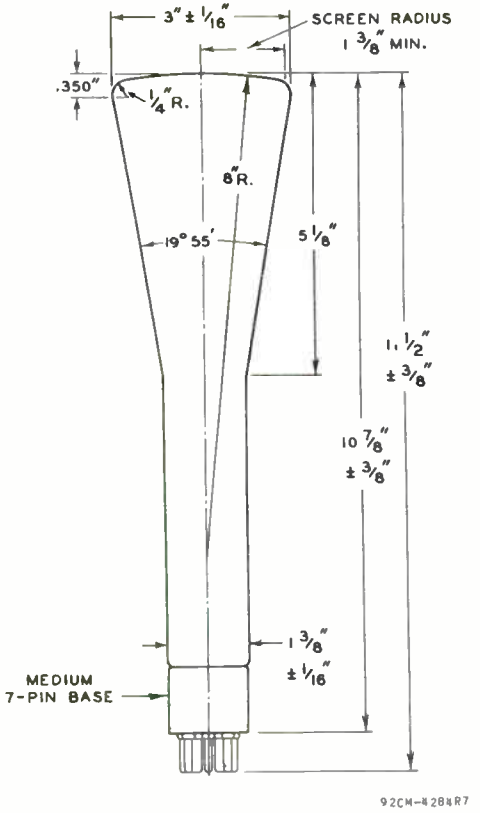
OSCILLOGRAPH TUBE



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

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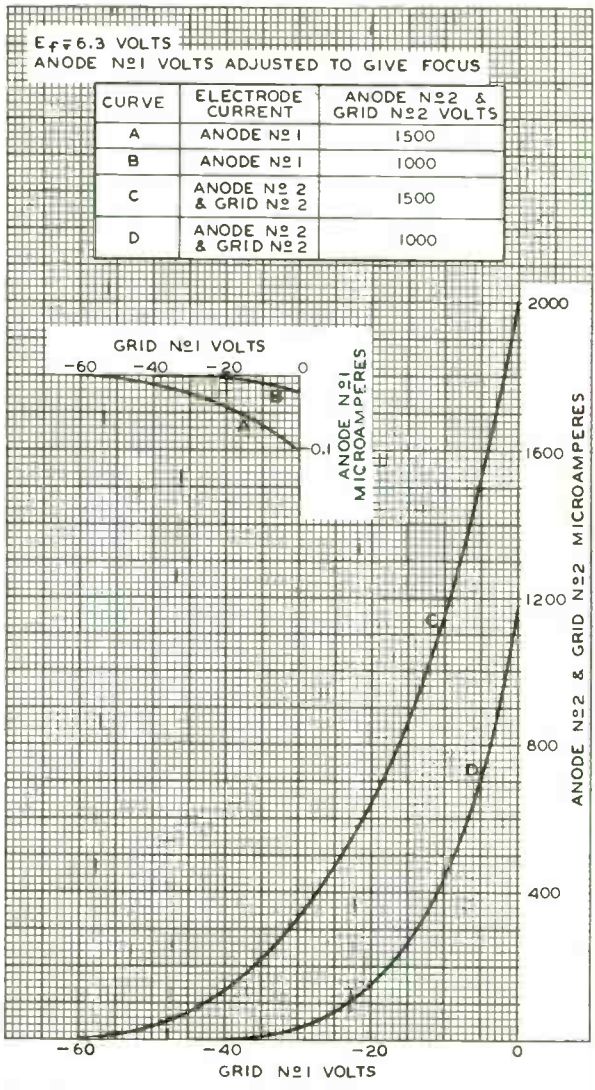
AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS
ANODE №1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE №2 & GRID №2 VOLTS
A	ANODE №1	1500
B	ANODE №1	1000
C	ANODE №2 & GRID №2	1500
D	ANODE №2 & GRID №2	1000



6499

RADECHON

CHARGE STORAGE TUBE
SINGLE-BEAM, BARRIER-GRID TYPE
NON-EQUILIBRIUM WRITING CAPACITANCE-DISCHARGE READING

DATA

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	9	μμf
Deflecting electrode DJ_1 to all other electrodes	13	μμf
Deflecting electrode DJ_2 to all other electrodes	13	μμf
Deflecting electrode DJ_3 to all other electrodes	11.5	μμf
Deflecting electrode DJ_4 to all other electrodes	11.5	μμf
DJ_1 to DJ_2	3	μμf
DJ_3 to DJ_4	3	μμf
Grid No.5 to backing-electrode	800	μμf
Grid No.5 and backing-electrode to collector	4	μμf
Collector to all other electrodes & external cylindrical shield	*See Curve*	
Focusing Method	Electrostatic	
Deflection Method	Electrostatic	
Overall Length	11-27/32" ± 3/8"	
Greatest Diameter of Tube	3.30" ± 0.05"	
Minimum Useful Storage-Surface Diameter	2-1/4"	
Mounting Position	Any except those positions where the diheptal base is up and the tube axis is at an angle of less than 60° from the vertical.	
Weight (Approx.)	1 lb	

Base:
On large end of tube . . . . Small-Button Twentyninar 8-Pin
(JETEC No.E8-19)

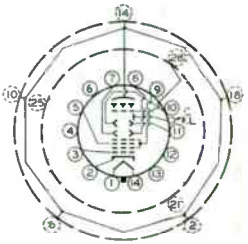
VIEW OF TWENTYNINAR-BASE END OF TUBE

Pin 2, Pin 6, Pin 10, Pin 14, Pin 18 } Multiple Connections to Backing-Electrode. Only One Need be Used

Pin 21 - No Connection

Pin 25 - No Connection

Pin 28 - Grid No.5



PINS 2,6,10,14,18: ON 1-7/8" DIA. PIN CIRCLE

PINS 21,25,28: ON 7/8" DIA. PIN CIRCLE

SOLID-LINE CIRCLES DEPICT DIHEPTAL BASE. BROKEN-LINE CIRCLES DEPICT TWENTYNINAR BASE

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On small end of tube. . . . . Small-Shell Diheptal 14-Pin (JETEC No.B14-45)

VIEW OF DIHEPTAL-BASE END OF TUBE

Pin 1 – Heater
Pin 2 – Cathode
Pin 3 – Grid No.1
Pin 4 – Internal Connection–Do Not Use
Pin 5 – Grid No.3
Pin 6 – No Connection
Pin 7 – Deflecting Electrode DJ_4
Pin 8 – Deflecting Electrode DJ_3
Pin 9 – Ultor (Grids No.2 & No.4)
Pin 10 – Deflecting Electrode DJ_2
Pin 11 – Deflecting Electrode DJ_1
Pin 12 – No Connection
Pin 13 – Same as Pin 4
Pin 14 – Heater
C,CL – External Conductive Coating, Collector, Internal Shield, Flange between Neck and Large Part of Tube

All voltages are with respect to cathode unless otherwise specified

Maximum Ratings, *Absolute Values:*

BACKING-ELECTRODE-TO-GRID-No.5 (BARRIER-GRID) VOLTAGE:		
Backing-electrode positive with respect to grid No.5	100 max.	volts
Backing-electrode negative with respect to grid No.5	100 max.	volts
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
GRID-No.1 VOLTAGE:		
Negative bias value.	200 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	10 max.	volts

Equipment Design Ranges:

*For any ultor voltage (E_{c_4}) 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.

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Collector-to-Grid-No.5 Voltage	0 to 50	volts
Grid-No.3 Voltage for Focus with grid-No.1 volts = 0	14% to 26% of E_{c_4}	volts
Grid-No.1 Voltage for collector-current cutoff	-2.5% to -4.7% of E_{c_4}	volts
Collector Current for grid-No.1 volts = 0	20 to 50	μamp
Max. Cathode Current for grid-No.1 volts = 0	*See Curve*	
Deflection Factors:		
DJ_1 and DJ_2	85 to 105 v dc/in./kv of E_{c_4}	
DJ_3 and DJ_4	78 to 96 v dc/in./kv of E_{c_4}	
Spot Position	See Note 2	
Signal-Uniformity Ratio	See Note 3	

Examples of Use Design Ranges:

For ultor voltage of	*1000*	*volts*
Grid-No.3 Voltage for Focus with grid-No.1 volts = 0	140 to 260	volts
Grid-No.1 Voltage for collector-current cutoff	-25 to -47	volts
Deflection Factors:		
DJ_1 and DJ_2	85 to 105	v dc/in.
DJ_3 and DJ_4	78 to 96	v dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting-Electrode Circuit#	1.0 max.	megohm

* In general, the recommended minimum ultor voltage should not be less than 1000 volts. Signal output and resolution decrease with decreasing ultor voltage. Secondary emission characteristics of the dielectric layer limit the maximum ultor voltage to 1500 volts.

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

Note 1: The backing-electrode, grid No.5, and ultor are usually operated at the same dc potential. During the writing cycle, the backing-electrode may be pulsed to ±60 volts with respect to grid No.5.

Note 2: The undeflected focused spot will fall within a circle having a diameter equal to 10% of the minimum storage-surface diameter and having its center coincident with the center of the storage surface.

Spot position is calculated as follows: With heater voltage of 6.3 volts, ultor voltage of 1000 volts, grid-No.5 voltage of 1000 volts, collector voltage of 1050 volts, grid-No.3 voltage adjusted to give focus, grid-No.1 voltage adjusted for 15 microamperes peak collector current, each deflecting electrode connected through a 1-megohm resistor to ultor, and the tube shielded from all extraneous fields, the voltages

Note 3: See next page.

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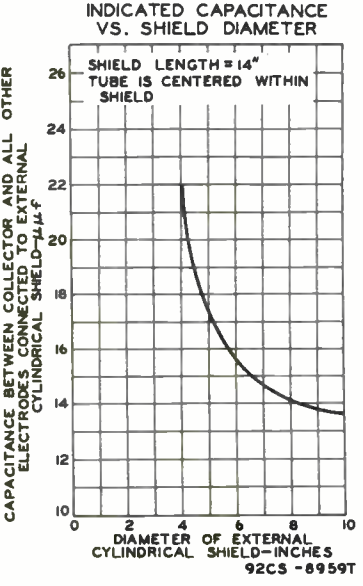
required to displace the beam from its undeflected position to the edge of the storage surface in the direction of each deflecting electrode are recorded as a for DJ_1, b for DJ_2, c for DJ_3, and d for DJ_4.

$$\text{Spot Position in \% of Storage-Surface Diameter} = 1/2\sqrt{\left(\frac{b-a}{b+a}\right)^2 + \left(\frac{d-c}{d+c}\right)^2} \times 100$$

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.



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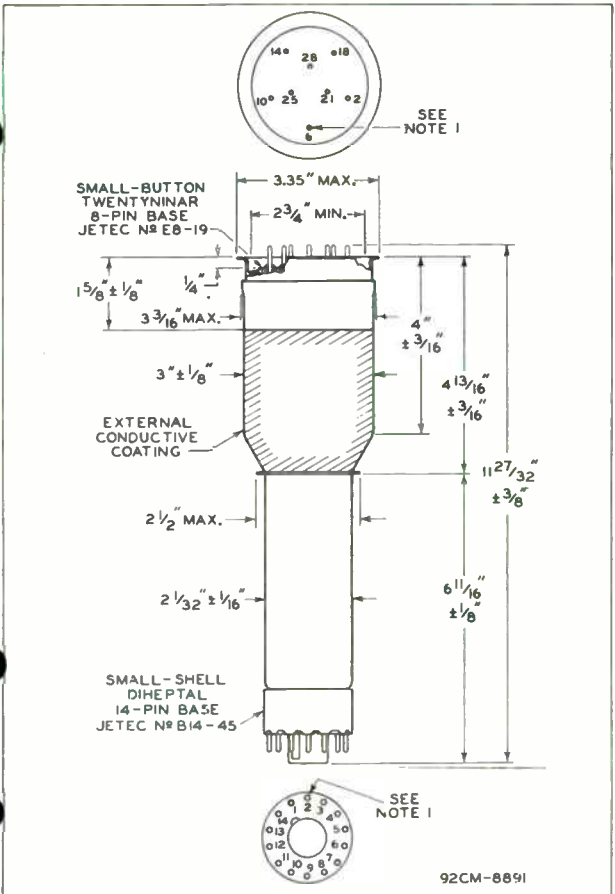

NOTE 1: THE ANGLE BETWEEN PLANE THROUGH PIN 6 OF TWENTY-NINAR BASE AND TUBE AXIS, AND PLANE THROUGH PIN 2 OF DIHEPTAL BASE AND TUBE AXIS WILL NOT EXCEED 10°. THE INDICATED PINS ARE BOTH ON THE SAME SIDE OF THE TUBE.

NOTE 2: DEFLECTING ELECTRODES DJ_1 & DJ_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° ± 3°.

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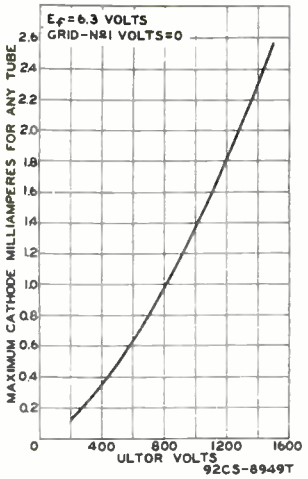
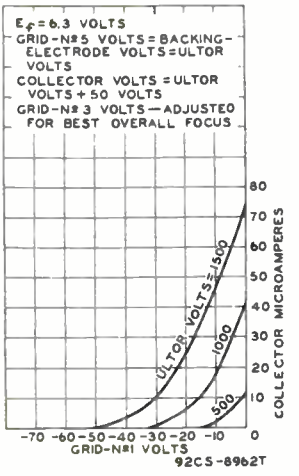
RADECHON

MAXIMUM CATHODE CURRENT



AVERAGE TRANSFER CHARACTERISTICS



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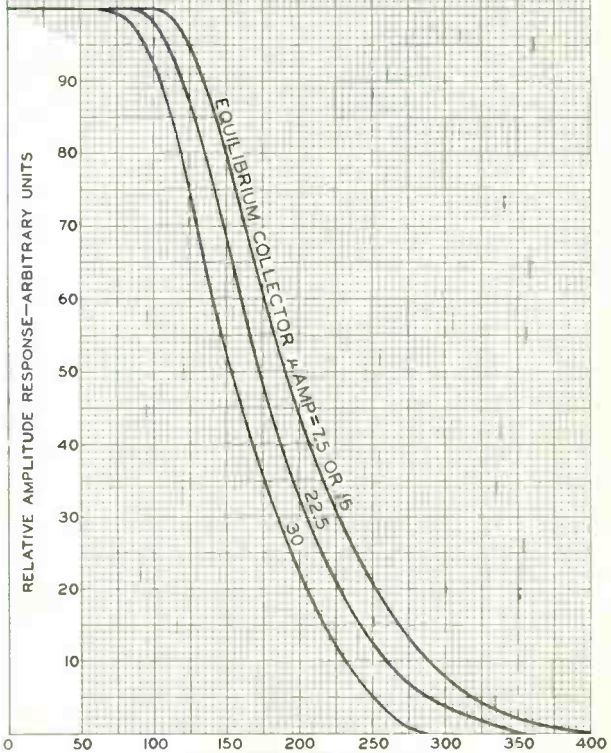
RESOLUTION CHARACTERISTICS

E_f=6.3 VOLTS
GRID-№5 VOLTS=ULTOR VOLTS=1000
COLLECTOR VOLTS=1050
GRID-№3 VOLTS—ADJUSTED FOR BEST OVERALL FOCUS
GRID-№1 VOLTS—ADJUSTED TO GIVE EQUILIBRIUM COLLECTOR CURRENT SHOWN ON EACH CURVE
BACKING-ELECTRODE:
DURING WRITING—PULSED APPROX. 50 VOLTS POSITIVE WITH RESPECT TO ULTOR
DURING READING—AT GRID-№5 POTENTIAL



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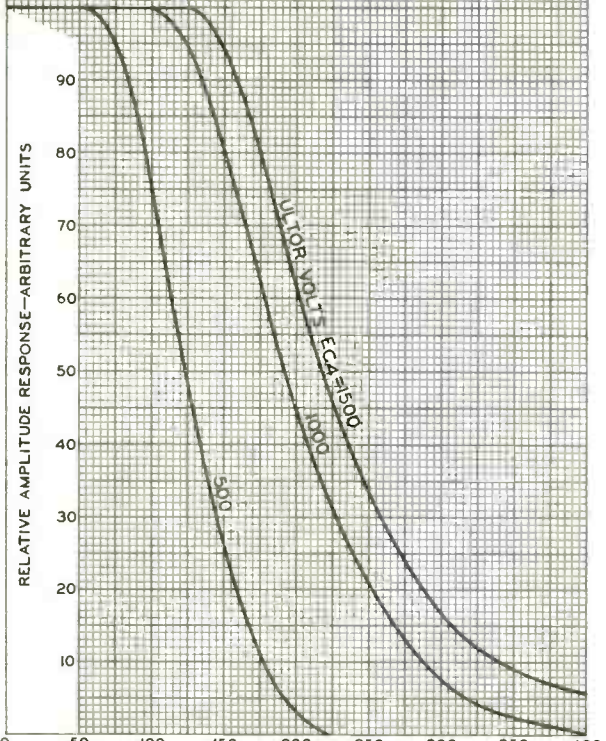
RESOLUTION CHARACTERISTICS

E_f=6.3 VOLTS
GRID-№5 VOLTS=ULTOR VOLTS
COLLECTOR VOLTS=ULTOR VOLTS+50 VOLTS
GRID-№3 VOLTS—ADJUSTED FOR BEST OVERALL FOCUS
GRID-№1 VOLTS—ADJUSTED TO GIVE EQUILIBRIUM COLLECTOR CURRENT OF 7.5 MICROAMPERES
BACKING-ELECTRODE:
DURING WRITING—PULSED APPROX. 50 VOLTS POSITIVE WITH RESPECT TO ULTOR
DURING READING—AT GRID-№5 POTENTIAL



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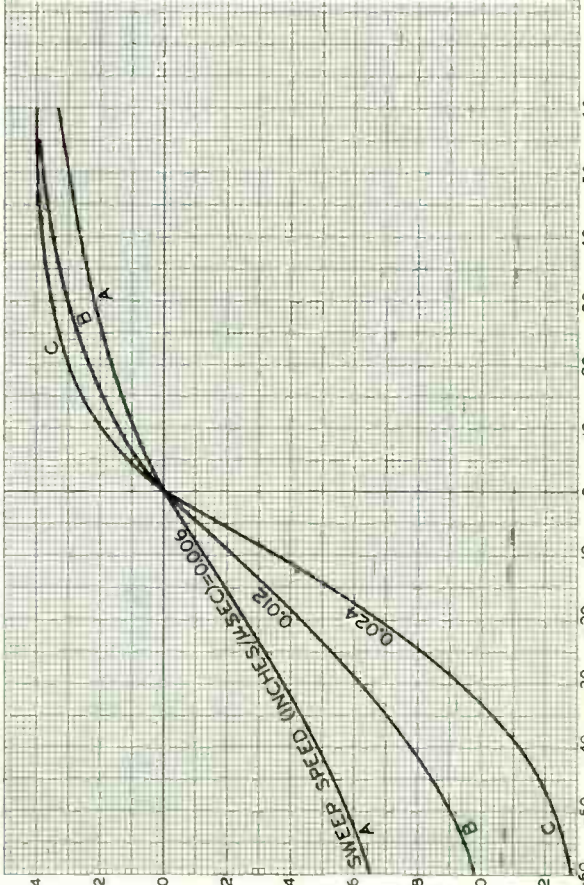
TYPICAL TARGET CHARACTERISTICS

E_f=6.3 VOLTS
GRID-№5 VOLTS=ULTOR VOLTS=1000
COLLECTOR VOLTS=1050
GRID-№3 VOLTS—ADJUSTED FOR BEST OVERALL FOCUS
GRID-№1 VOLTS—ADJUSTED TO GIVE EQUILIBRIUM COLLECTOR CURRENT OF 15 MICROAMPERES
STORAGE SURFACE IS AT EQUILIBRIUM POTENTIAL PRIOR TO APPLICATION OF PULSE



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92CL-8961

6499

RCA

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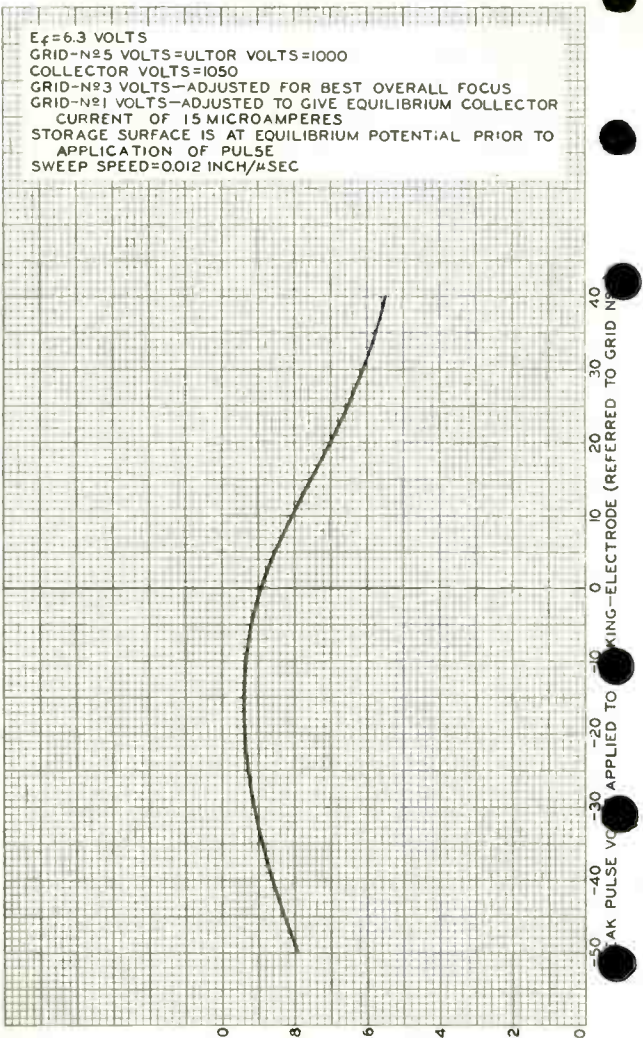
APPROXIMATE DISCHARGE-FACTOR CHARACTERISTIC

E_f=6.3 VOLTS
GRID-№5 VOLTS=ULTOR VOLTS=1000
COLLECTOR VOLTS=1050
GRID-№3 VOLTS—ADJUSTED FOR BEST OVERALL FOCUS
GRID-№1 VOLTS—ADJUSTED TO GIVE EQUILIBRIUM COLLECTOR CURRENT OF 15 MICROAMPERES
STORAGE SURFACE IS AT EQUILIBRIUM POTENTIAL PRIOR TO APPLICATION OF PULSE
SWEEP SPEED=0.012 INCH/μSEC



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8960

6866
DISPLAY STORAGE TUBE

DIRECT-VIEW TYPE
4"-DIAMETER DISPLAY
NON-EQUILIBRIUM WRITING GRID-CONTROL READING (VIEWING)

DATA

General:

	Writing Section	Viewing Section	
Heater, for Unipotential Cathode:			
Voltage (AC or DC)	6.3	6.3	volts
Current	0.6	0.6	amp
Minimum Cathode Heating Time before other electrode voltages are applied	-	30	sec
Direct Interelectrode Capacitances (Approx.):[1]			
Grid No.1 to all other tube electrodes	6	18	μμf
Cathode to all other tube electrodes	4.2	6.5	μμf
Deflecting electrode DJ_1 to deflecting electrode DJ_2	1.8	-	μμf
Deflecting electrode DJ_3 to deflecting electrode DJ_4	1.8	-	μμf
DJ_1 to all other tube electrodes	7.5	-	μμf
DJ_2 to all other tube electrodes	8	-	μμf
DJ_3 to all other tube electrodes	6	-	μμf
DJ_4 to all other tube electrodes	7	-	μμf
Focusing Method	Electrostatic	None	
Deflection Method	Electrostatic	None	
Deflecting-Electrode Arrangement	*See Dimensional Outline*	-	
Phosphor	-	High-Visual-Efficiency Type, Aluminized	
Fluorescence	-	Yellow	
Phosphorescence	-	Yellow	

Minimum Useful Screen Diameter	4"
Maximum Overall Length	15-1/2"
Seated Length	14" ± 3/8"
Maximum Tube Radius	3-5/32"
Bulb-Flange Diameter	5-1/8" ± 1/16"
Greatest Bulb Diameter	5" ± 1/16"
Bulb Terminals:	
Caps (Two)	Recessed Small Cavity (JETEC No.J1-21)
Flange	*See Dimensional Outline*
Flexible cable	*See Dimensional Outline*
Ambient-Temperature Range	-65° to +100 °C
Mounting Position	Any
Weight (Approx.)	2 lbs
Socket	Alden Part No.43558A, or equivalent
Base	Small-Button Thirtyfivar 31-Pin (JETEC No.E31-36)

[1] Without external shield.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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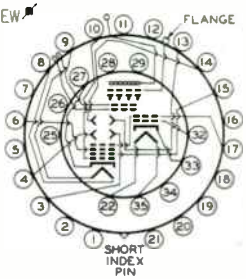
DISPLAY STORAGE TUBE

BOTTOM VIEW*



Pin 1 – No Connection
Pin 2 – Same as Pin 1
Pin 3 – Deflecting Electrode DJ_4 of Writing Gun
Pin 4 – Deflecting Electrode DJ_3 of Writing Gun
Pin 5 – Same as Pin 1
Pin 6 – Grid No.3 of Writing Gun
Pin 7 – Same as Pin 1
Pin 8 – Heater of Writing Gun
Pin 9 – Heater of Writing Gun
Pin 10 – Grid No.1 of Writing Gun
Pin 11 – Same as Pin 1
Pin 12 – Same as Pin 1
Pin 13 – Deflecting Electrode DJ_1 of Writing Gun
Pin 14 – Deflecting Electrode DJ_2 of Writing Gun
Pin 15 – Grid No.2 of Writing Gun
Pin 16 – Internal Connection–Do Not Use
Pin 17 – Grid No.4 of Writing Gun, Grid No.2 of Viewing Gun
Pin 18 – Same as Pin 1
Pin 19 – Same as Pin 1
Pin 20 – Same as Pin 16
Pin 21 – Same as Pin 1
Pin 22 – Heater of Viewing Gun
Pin 25 – Same as Pin 1
Pin 26 – Same as Pin 1
Pin 27 – Cathode of Writing Gun
Pin 28 – Same as Pin 1
Pin 29 – Same as Pin 1
Pin 32 – Grid No.1 of Viewing Gun
Pin 33 – Cathode of Viewing Gun
Pin 34 – Same as Pin 1
Pin 35 – Heater of Viewing Gun
Flexible Cable – Connection to Screen
Flange – Backing–Electrode
Recessed Cavity Cap – *Nearer Tube Face*–Grid No.4 of Viewing Gun
Nearer Electron Guns–Grid No.3 of Viewing Gun

Maximum Ratings, *Absolute Values:*

	Writing Section	Viewing Section**	
SCREEN VOLTAGE	–	11000 max.	volts
PEAK BACKING-ELECTRODE VOLTAGE	–	20 max	volts

* Pins 23 and 31 are not shown because they are trimmed to the same dimension as the short index pin and are not to be used.

**: See next page.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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DISPLAY STORAGE TUBE

	Writing Section		Viewing Section**	
	Equivalent Values			
GRID-No.4 VOLTAGE	2900 max.*	150 max.**	300 max.	volts
GRID-No.3 VOLTAGE	1000 max.*	-	300 max.	volts
GRID-No.2 VOLTAGE	2750 max.*	-	150 max.	volts
CATHODE VOLTAGE	-	-2900 max.**	-	volts
GRID-No.1 VOLTAGE:				
Negative bias value . .	200 max.*		100 max.	volts
Positive bias value . .	0 max.*		0 max.	volts
Positive peak value . .	2 max.*		0 max.	volts
PEAK VOLTAGE BETWEEN GRID No.4 AND ANY DEFLECTING ELECTRODE. .	500 max.		-	volts
PEAK HEATER-CATHODE VOLTAGE:				
Heater negative with respect to cathode. .	125 max.*		125 max.	volts
Heater positive with respect to cathode. .	125 max.*		125 max.	volts

VIEWING SECTION**

Operating Values and Typical Performance Characteristics:

Screen Voltage	5000	10000	10000	volts
DC Backing-Electrode Voltage	5	5	5	volts
Grid-No.4 Voltage	150	210	150	volts
Grid-No.3 Voltage#.	25 to 125	50 to 150	25 to 125	volts
Grid-No.2 Voltage†#	50 to 75	70 to 105	50 to 75	volts
Grid-No.1 Voltage#.	0 to -50	0 to -75	0 to -50	volts
Maximum Screen Current. . .	350	600	350	μamp
Maximum Peak Backing-Electrode Current	1.5	2	1.5	ma
Maximum Grid-No.4 Current♦.	2	3	2	ma
Maximum Grid-No.3 Current♦.	1.5	2	1.5	ma
Maximum Cathode Current♦. .	3	4	3	ma
Writing Speed††	300000	300000	300000	in./sec
Number of Half-Tone Steps□ .	5	5	5	
Viewing Duration▲	40	20	40	sec
Maximum Erasing-Uniformity Factor□□.	0.5	0.5	0.5	
Resolution●.	50	50	50	lines/in.
Brightness●●.	275	2750	1500	fl ←

** Voltages are shown with respect to cathode of Viewing Gun.

\# Adjusted for brightest, most uniform pattern.

† Grid No.2 of the Viewing Gun is connected internally to grid No.4 of the Writing Gun.

♦ For conditions with combined adjustment of grid-No.1 voltage, grid-No.2 voltage, and grid-No.3 voltage to give brightest, most uniform pattern.

*, ††, □, ▲, □□, ●, ●●: See next page.

← Indicates a change.

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

6866

DISPLAY STORAGE TUBE

WRITING SECTION●

Range Values for Equipment Design:*

With any grid-No.2 voltage (E_{c_2}) between 500 and 2750 volts

Grid-No.4 Voltage (E_{c_4})	95% to 105% of E_{c_2}	volts
Grid-No.3 Voltage for Focus	14% to 28% of E_{c_2}	volts
Maximum Grid-No.1 Voltage for Cutoff of Undeflected Focused Spot	-4.6% of E_{c_2}	volts
Maximum Grid-No.3 Current	-15 to +10	μamp
Maximum Cathode Current	*See Curve*	
Deflection Factors:		
DJ_1 and DJ_2	28 to 38	v dc/in./kv of E_{c_4}
DJ_3 and DJ_4	28 to 38 ##	v dc/in./kv of E_{c_4}
Focused Beam Position		

Examples of Use of Design Ranges:*

With grid-No.2 voltage of	*1500*	*2500*	*volts*
Grid-No.4 Voltage (E_{c_4})	1425 to 1575	2375 to 2625	volts
Grid-No.3 Voltage for Focus	210 to 420	350 to 700	volts
Maximum Grid-No.1 Voltage for Cutoff of Undeflected Focused Spot	-69	-115	volts
Deflection Factors when $E_{c_4} = E_{c_2}$:			
DJ_1 and DJ_2	42 to 57	70 to 95	v dc/in.
DJ_3 and DJ_4	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:

Grid-No.1-Circuit Resistance (Either gun)	1.0 max.	megohm
Resistance in Any Deflecting-Electrode Circuit■	0.1 max.	megohm
Backing-Electrode-Circuit Resistance	0.005 max.	megohm
Series Current-Limiting Resistance in Screen Circuit	1.0 min.	megohm

* Voltages are shown with respect to cathode of Writing Gun.

†† Measured under conditions of writing from just zero brightness (viewing-beam 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.

□ Observed with an RCA-2F21 Monoscope display.

▲, □□, ●, ††, ●, ##, ■: See next page.

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

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DISPLAY STORAGE TUBE

▲ 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% of the maximum brightness.

□□ Defined as $(t_2 - t_1)/t_2$, where

t_1 = time measured from start of erasing to instant at which any screen area is reduced to zero brightness.

t_2 = time measured from start of erasing to instant at which entire screen area is reduced to zero brightness.

● 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 +2500 volts with respect to cathode of Writing Gun.

●● 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.

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.4 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 1/16-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 viewing-gun 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.

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

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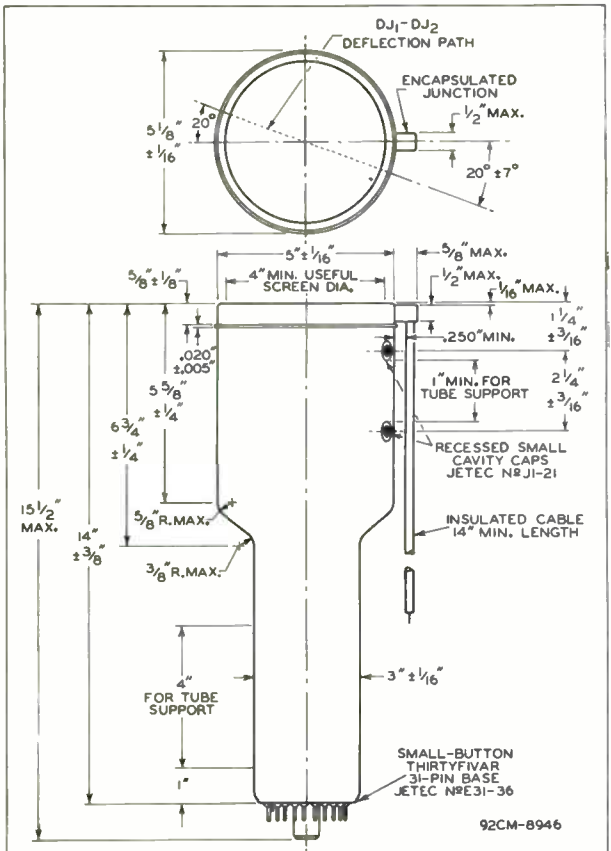
DISPLAY STORAGE TUBE



CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 3° 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_1 AND DJ_2 BY THE FOLLOWING ANGULAR TOLERANCES (MEASURED ABOUT THE TUBE AXIS): PIN 27, ± 10°; EACH CAVITY CAP (ON SAME SIDE AS PIN 27), ± 17°; ENCAPSULATED JUNCTION, + 10°. ANGLE BETWEEN DJ_1 - DJ_2 DEFLECTION PATH AND DJ_3 - DJ_4 DEFLECTION PATH IS 90° ± 3°.

ELECTRON TUBE DIVISION
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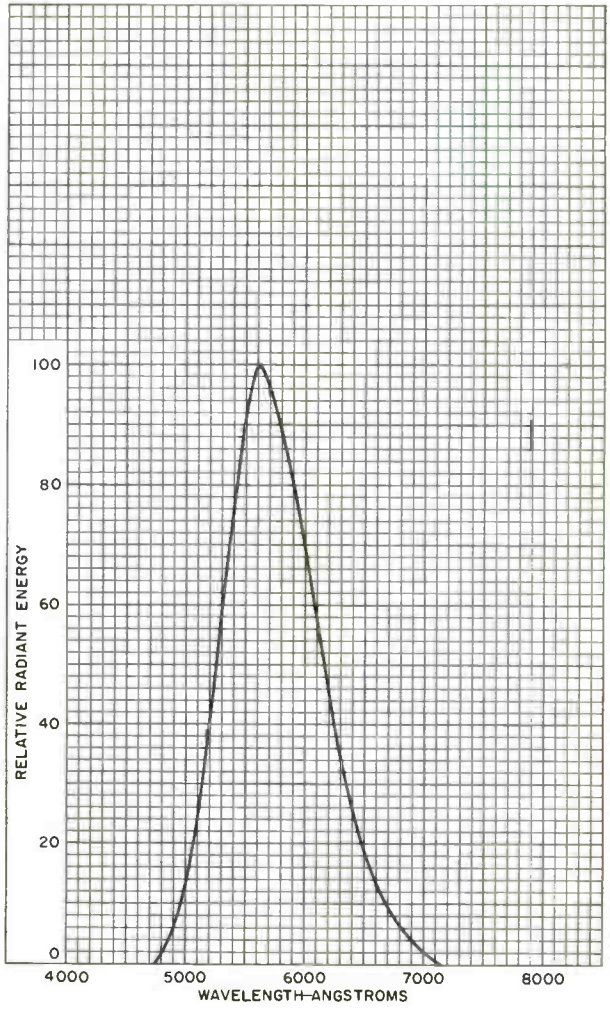
SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR



RCA

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AVERAGE CHARACTERISTIC

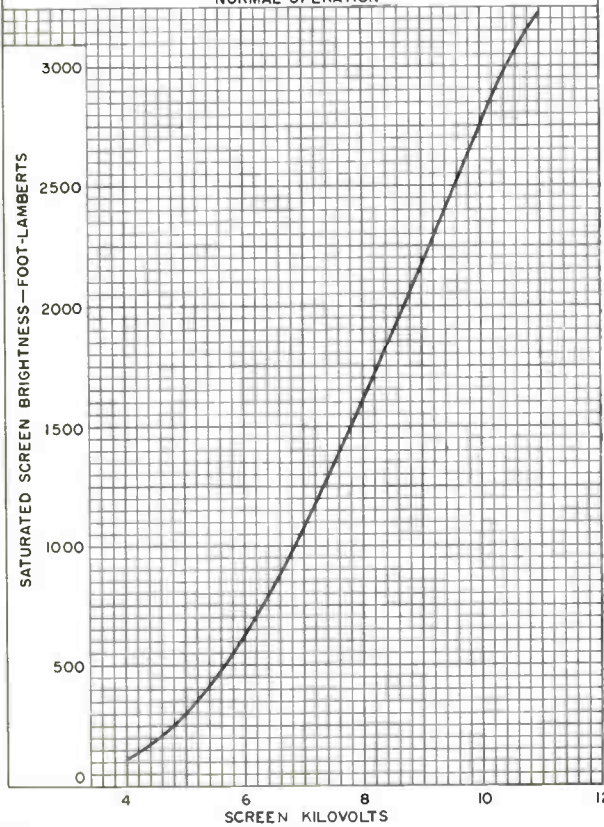
VIEWING SECTION

E_f = 6.3 VOLTS
BACKING-ELECTRODE VOLTS* = 5
GRID-No 4 VOLTS* = 210
GRID-No 2 VOLTS* = 85
GRID-No 3 VOLTS* } ADJUSTED FOR BRIGHTEST,
GRID-No 1 VOLTS* } MOST UNIFORM DISPLAY.

*REFERRED TO CATHODE OF VIEWING GUN.

WRITING SECTION

NORMAL OPERATION



6866

AVERAGE CHARACTERISTICS

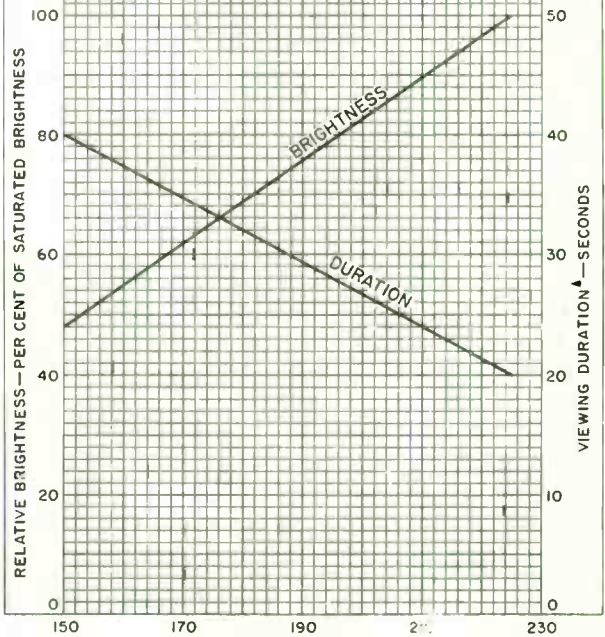
VIEWING SECTION

E_f = 6.3 VOLTS
SCREEN KILOVOLTS* = 5 TO 10
BACKING-ELECTRODE VOLTS* = 5
GRID-No 2 VOLTS* = 85
GRID-No 3 VOLTS* } ADJUSTED FOR BRIGHTEST,
GRID-No 1 VOLTS* } MOST UNIFORM DISPLAY
*REFERRED TO CATHODE OF VIEWING GUN

WRITING SECTION

NORMAL OPERATION

▲FOR EXPLANATION, SEE TABULATED DATA



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9044

RCA

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TYPICAL ERASURE CHARACTERISTICS

VIEWING SECTION

E_f = 6.3 VOLTS

SCREEN KILOVOLTS* = 10

GRID-№ 4 VOLTS* = 210

GRID-№ 2 VOLTS* = 85

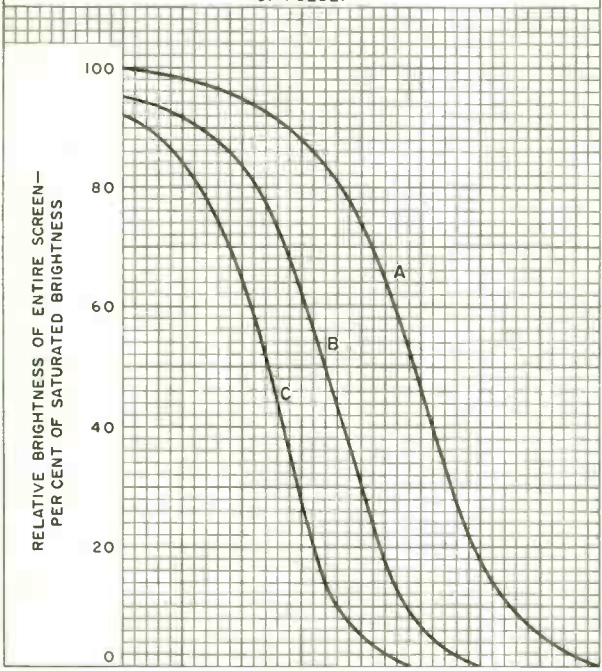
GRID-№ 3 VOLTS* } ADJUSTED FOR BRIGHTEST, MOST UNIFORM DISPLAY

GRID-№ 1 VOLTS* }

*REFERRED TO CATHODE OF VIEWING GUN

CURVE	BACKING-ELECTRODE VOLTS	
	DC	POSITIVE RECTANGULAR PULSE AMPLITUDE (APPROX.)
A	10	10
B	5	8
C	2	7

ERASURE IS PRODUCED BY POSITIVE RECTANGULAR PULSE APPLIED TO BACKING-ELECTRODE. INDICATED DURATION IS SUM OF DURATIONS OF NUMBER OF PULSES OR ELAPSED TIME AFTER START OF PULSE.



TUBE DIVISION

92CM-9045

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6866

CURRENT CHARACTERISTIC
FOR WRITING GUN

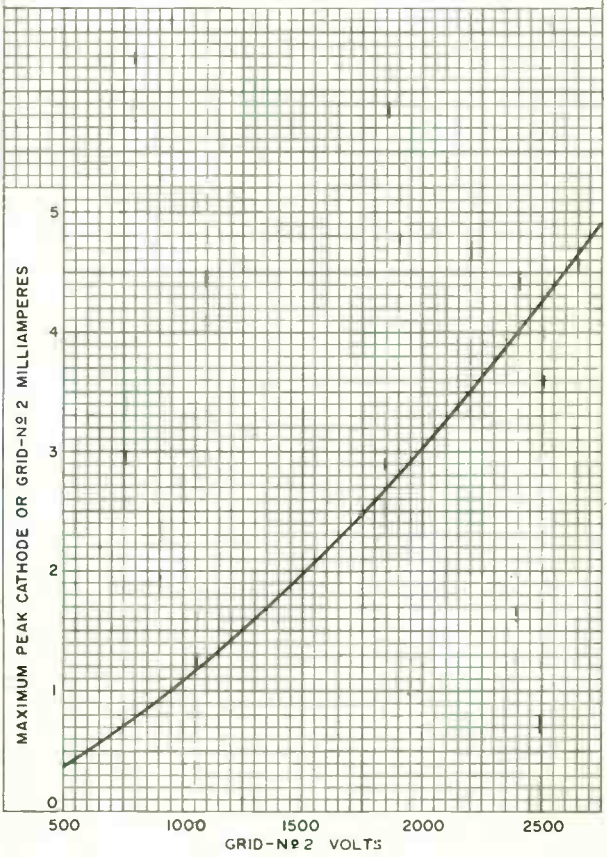
WRITING SECTION

E_f = 6.3 VOLTS
GRID-№ 4 VOLTS* = GRID-NO. 2 VOLTS
GRID-№ 3 VOLTS* = ADJUSTED FOR FOCUS
GRID-№ 1 VOLTS* = 0

*REFERRED TO CATHODE OF WRITING GUN

VIEWING SECTION

NORMAL OPERATION



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9046

6866

6866

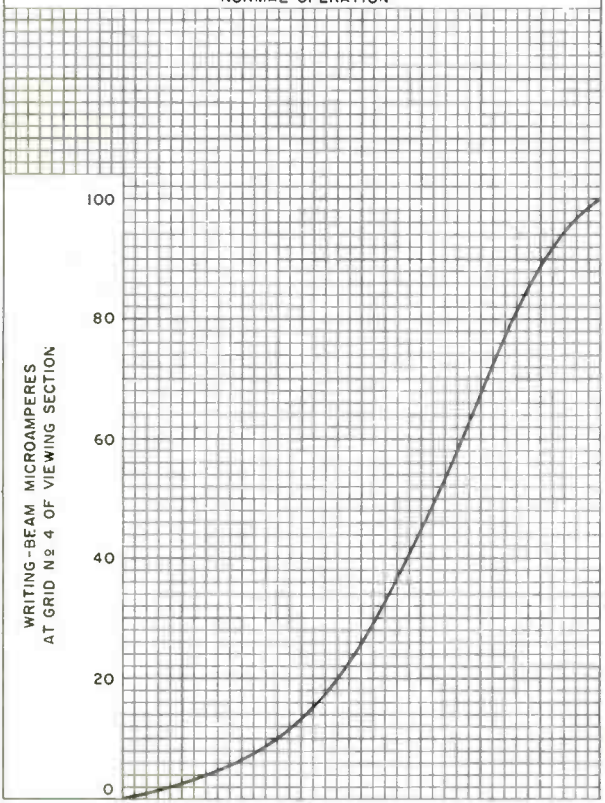
TYPICAL DRIVE CHARACTERISTIC
FOR WRITING GUN

WRITING SECTION

E_f = 6.3 VOLTS
GRID-Nº 4 VOLTS* = 2500
GRID-Nº 3 VOLTS* = ADJUSTED FOR FOCUS
GRID-Nº 2 VOLTS* = 2500
GRID-Nº 1 * BIASED TO SPOT CUTOFF
*REFERRED TO CATHODE OF WRITING GUN

VIEWING SECTION

NORMAL OPERATION



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9048

7183
DISPLAY STORAGE TUBE

DIRECT-VIEW TYPE
4"-DIAMETER DISPLAY

WRITING GUN:
MAGNETIC 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 ± 10%	6.3 ± 10%	volts
Current.	0.6	0.6	amp
Minimum Cathode Heating Time before other electrode voltages are applied.	–	30	sec
Direct Interelectrode Capacitances (Approx.):[o]			
Grid No.1 to all other tube electrodes. . .	7	7.5	μμf
Cathode to all other tube electrodes. . .	5	5	μμf
Backplate to all other tube electrodes. . .	–	300	μμf
Focusing Method.	Electrostatic	None	
Deflection Method. . . .	Magnetic	None	
Deflection Angle	♦	–	
Phosphor	–	P20, Aluminized	
Fluorescence	–	Yellow-Green	
Phosphorescence. . . .	–	Yellow-Green	

Minimum Useful Screen Diameter . . . . . 4"
Maximum Overall Length . . . . . 11.62"
Seated Length. . . . . 11.16" ± 0.10"
Maximum Tube Radius. . . . . 3.00"
Maximum Tube Diameter. . . . . 5.19"
Greatest Bulb Diameter . . . . . 5.00" ± 0.06"
Ambient-Temperature Range. . . . . -65° to $+100^{\circ}$ C
Operating Position . . . . . Any
Weight (Approx.) . . . . . 1-3/4 lbs
Terminal Connectors. . . . . *See Operating Considerations*
Bulb Terminals:
  Caps (Three) . . . . . Recessed Small Cavity (JETEC No.J1-21)
  Flexible leads (Two) . . . . . *See Dimensional Outline*
Base:
  Writing gun. . . . . Small-Button Neoditetrar 8-Pin (JETEC No.E8-49)
  Viewing gun. . . . . Small-Button Miniature 7-Pin (JETEC No.E7-1)

o, ♦: See next page.

ELECTRON TUBE DIVISION
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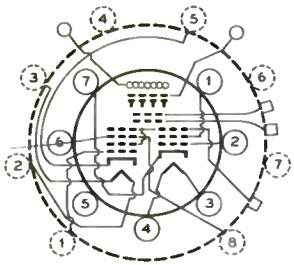
DISPLAY STORAGE TUBE

BOTTOM VIEW



SOLID-LINE CIRCLES DEPICT
MINIATURE 7-PIN BASE
BROKEN-LINE CIRCLES DEPICT
NEODITETRAR 8-PIN BASE

WRITING SECTION▲

Small-Button Neoditetrar 8-Pin Base

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

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 – No Connection
Pin 7 – Cathode

Flexible Lead (Large) – Screen
Flexible Lead (Small) – Backplate
Recessed Cavity Cap:
Located 1-1/4" from Tube Face – Grid No. 5
Located 3" from Tube Face – Grid No. 4
Located Near Viewing Gun – Grid No. 3, Grids No. 4 & No. 2 of Writing Gun

Maximum Ratings, *Absolute Values:*

	Writing Section	Viewing Section	
SCREEN VOLTAGE .	–	10000 max.**	volts
PEAK BACKPLATE VOLTAGE. . . .	–	30 max.**	volts

○, ♦, ▲, **: See next page.

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DISPLAY STORAGE TUBE

	Writing Section *Equivalent Values*		Viewing Section *Equivalent Values*		
GRID-No.5 VOLTAGE. . . .	–	–	–	300 max.**	volts
GRID-No.4 VOLTAGE. . . .	2900 max.*▲	150 max.**	–	150 max.**	volts
GRID-No.3 VOLTAGE. . . .	1200 max.*	–	2900 max.*▲	150 max.**	volts
GRID-No.2 VOLTAGE. . . .	2900 max.*▲	150 max.**	–	150 max.**	volts
CATHODE VOLTAGE.	–	-2750 max.**	–	–	volts
GRID-No.1 VOLTAGE:					
Negative-bias value. . . .	200 max.*		100 max.**		volts
Positive-bias value. . . .	0 max.*		0 max.**		volts
Positive-peak value. . . .	2 max.*		0 max.**		volts
PEAK HEATER-CATHODE VOLTAGE:					
Heater negative with respect to cathode. . .	125 max.*		125 max.**		volts
Heater positive with respect to cathode. . .	125 max.*		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 beam on till the writing beam is turned off

Screen Voltage	8500	volts
DC Backplate Voltage	0	volts
Grid-No.5 Voltage#	220 to 250	volts
Grid-No.4 Voltage#	40 to 100	volts
Grid-No.3 Voltage#▲	10 to 40**	volts
	2510 to 2540*	volts
Grid-No.2 Voltage#	100	volts
Grid-No.1 Voltage#	0 to -75	volts
Maximum Screen Current	0.6	ma
Maximum Peak Backplate Current	2	ma
Maximum Grid-No.5 Current	2.4	ma

o, ♦, ▲, **, *, #, •: See next page.

RCA

7183

DISPLAY STORAGE TUBE

Maximum Grid-No.4 Current	0.3	ma
Maximum Grid-No.3 Current	0.5	ma
Maximum Grid-No.2 Current	0.08	ma
Maximum Cathode Current	4	ma
Number of Half-Tone Steps□	5	
Viewing Duration▲▲	20	sec
Maximum Erasing-Uniformity Factor:□□		
For 4"-diameter area (A_4)	0.65	
For the 3.5"-diameter portion ($A_{3.5}$) centered on A_4	0.50	
Resolution#	50	lines/in.
Brightness♦♦	1500	fl

WRITING SECTION●

Operating Values:

	Equivalent Values		
Grid-No.4 Voltage#▲	2510 to 2540*	10 to 40**	volts
Grid-No.3 Voltage for focus	425 to 925*	-	volts
Grid-No.2 Voltage#▲	2510 to 2540*	10 to 40**	volts
Maximum Grid-No.1 Voltage for cutoff of undeflected focused spot	-130*	-2630**	volts
Cathode Voltage	-	-2500**	volts
Maximum Grid-No.3 Current	-15 to +10		μa
Maximum Peak Cathode Current	4.5		ma

VIEWING SECTION AND WRITING SECTION

Maximum and Minimum Circuit Values:

Grid-No.1-Circuit Resistance (Either gun)	1 max.	megohm
Series Current-Limiting Resistor (Unbypassed) in Grid-No.5 (Viewing-Section) Circuit	0.005 min.	megohm
Backplate-Circuit Resistance	0.005 max.	megohm
Series Current-Limiting Resistance in Screen Circuit	1 min.	megohm

○ Without external shield.

♦ *See accompanying drawing CE-9578 showing angles of deflection.*

▲ Grids No.4 & No.2 of Writing Gun are connected together and to grid No.3 of Viewing Gun within the tube.

** Voltages are shown with respect to cathode of Viewing Gun.

* Voltages are shown with respect to cathode of Writing Gun.

Adjusted for brightest, most uniform pattern.

♦♦ For conditions with combined adjustment of grid-No.1 voltage, grid-No.2 voltage, grid-No.3 voltage, and grid-No.4 voltage to give brightest, most uniform pattern. After final adjustment, the grid-No.1 voltage should not be more positive than -20 volts to maintain electrode current within the maximum value indicated.

□ 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% of saturated brightness.

□□, ♦, ♦♦, ●: See next page.

ELECTRON TUBE DIVISION
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7183

DISPLAY STORAGE TUBE

□□ 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 (t_1) from start of erasing to the instant at which any area within the 4" diameter (or the 3.5"-diameter portion) is reduced to background-brightness level, and time (t_2) from start of erasing to the instant at which the entire area within the 4" diameter area (or the 3.5"-diameter portion) is reduced to background-brightness level. The erasing-uniformity factor is defined as $(t_2-t_1)/t_2$.

◆ 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 +2500 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 −2500 volts with respect to the cathode of the Viewing Gun which is usually operated at ground potential.

OPERATING CONSIDERATIONS

Support and shielding for the 7183 may be provided by a shield made of properly annealed high-permeability material. The screen lead and the backplate lead should be placed outside the shield.

Terminal Connectors. The *base pins* of the Neoditetrar 8-pin base on the Writing-Gun neck fit the Ditetrar 8-contact connector, such as Cinch No.54A18088, or equivalent. The *base pins* of the Small-Button Miniature 7-pin base on the Viewing-Gun neck fit the Miniature 7-contact socket. The *recessed cavity caps* require standard flexible-lead connectors as used for television picture tubes.

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.

RCA

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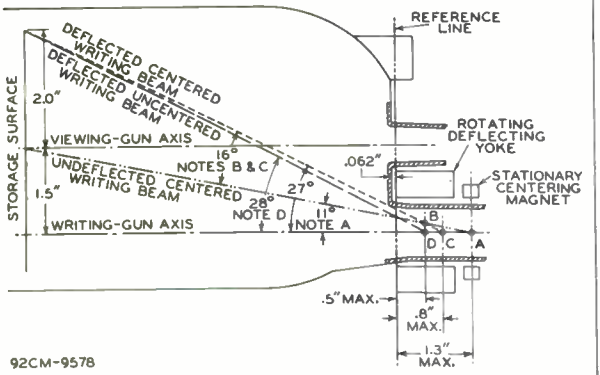
DISPLAY STORAGE TUBE

ANGLES OF DEFLECTION AND CENTERS OF DEFLECTION FOR WRITING GUN WHEN USED WITH ROTATING 2-COIL YOKE AND STATIONARY 4-COIL YOKE



92CM-9578

NOTE A: CENTERING OF THE WRITING BEAM ON THE STORAGE SURFACE IS NECESSARY FOR A CENTERED PPI DISPLAY. THE BEAM IS CENTERED BY SHIFTING IT FROM THE WRITING-GUN AXIS THROUGH AN ANGLE OF 11° WITH A CENTERING MAGNET WHOSE EFFECTIVE CENTER (A) IS LOCATED 1.3" FROM REFERENCE LINE.

NOTE B: WITH ROTATING YOKE WHOSE EFFECTIVE CENTER OF DEFLECTION (B) IS LOCATED 0.5" FROM REFERENCE LINE, THE CENTERED WRITING BEAM (NOTE A) MUST BE DEFLECTED THROUGH AN ANGLE OF 32° TO SWEEP FULLY THE STORAGE SURFACE.

NOTE C: WITH STATIONARY TV-TYPE YOKE WHOSE EFFECTIVE CENTER OF DEFLECTION (C) IS LOCATED 0.8" FROM REFERENCE LINE, THE CENTERED WRITING BEAM MUST BE DEFLECTED THROUGH AN ANGLE OF 32° TO SWEEP FULLY THE STORAGE SURFACE.

NOTE D: WHEN ROTATING YOKE IS USED WITH UNCENTERED DISPLAY, i.e., THE WRITING BEAM IS NOT CENTERED (NOTE A) BUT STRIKES THE STORAGE SURFACE ON THE WRITING-GUN AXIS, AND WITH THE EFFECTIVE CENTER OF DEFLECTION OF THE ROTATING YOKE LOCATED 0.5" FROM THE REFERENCE LINE, THE UNCENTERED WRITING BEAM MUST BE DEFLECTED THROUGH AN ANGLE OF 56° TO SWEEP FULLY THE STORAGE SURFACE.

RCA

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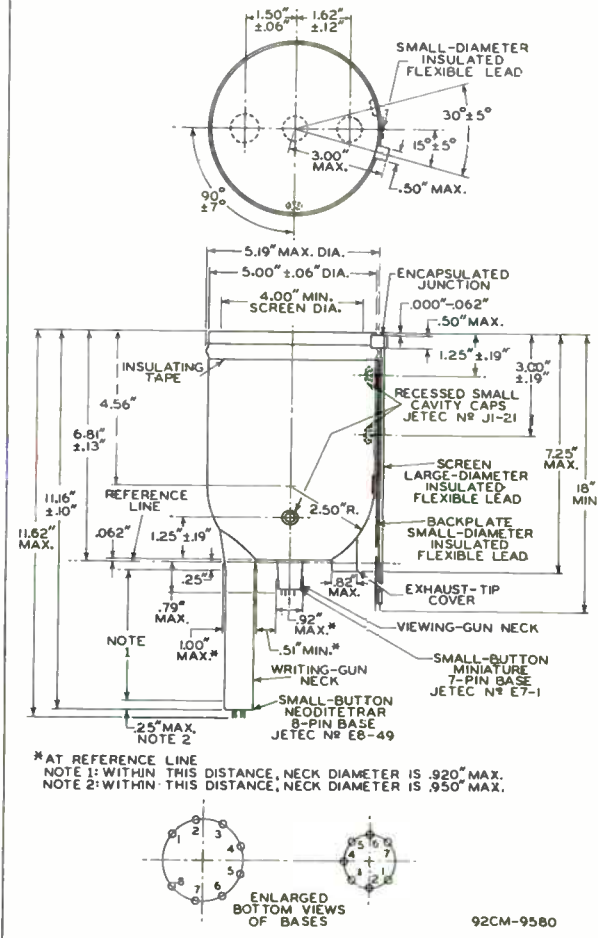
DISPLAY STORAGE TUBE



*AT REFERENCE LINE
NOTE 1: WITHIN THIS DISTANCE, NECK DIAMETER IS .920" MAX.
NOTE 2: WITHIN THIS DISTANCE, NECK DIAMETER IS .950" MAX.

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TYPICAL CHARACTERISTIC

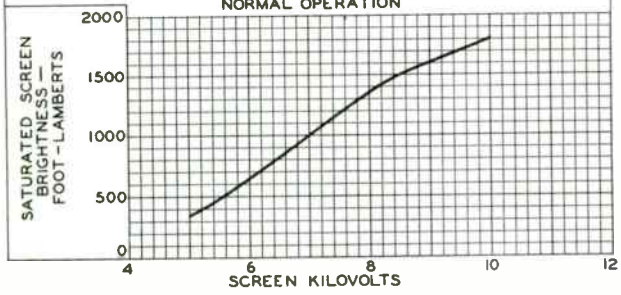
VIEWING SECTION

E_f = 6.3 VOLTS
BACKPLATE VOLTS* = 0
GRID-№5 VOLTS* = 250
GRID-№2 VOLTS* = 100
GRID-№4 VOLTS*
GRID-№3 VOLTS*
GRID-№1 VOLTS*
} ADJUSTED FOR BRIGHTEST, MOST UNIFORM DISPLAY.

*REFERRED TO CATHODE OF VIEWING GUN.

WRITING SECTION

NORMAL OPERATION



92CS-9553

TYPICAL STORAGE-GRID CHARACTERISTIC

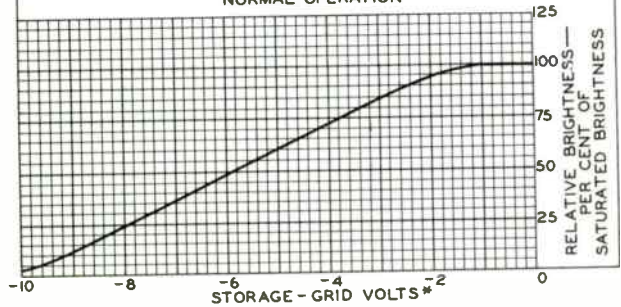
VIEWING SECTION

E_f = 6.3 VOLTS
SCREEN VOLTS* = 8500
BACKPLATE VOLTS* = 0
GRID-№5 VOLTS* = 250
GRID-№4 VOLTS
GRID-№3 VOLTS
GRID-№1 VOLTS
GRID-№2 VOLTS* = 100
} ADJUSTED FOR BEST COLLIMATION.

*REFERRED TO CATHODE OF VIEWING GUN.

WRITING SECTION

NORMAL OPERATION



ELECTRON TUBE DIVISION
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92CS-9554

RCA

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TYPICAL ERASURE CHARACTERISTICS

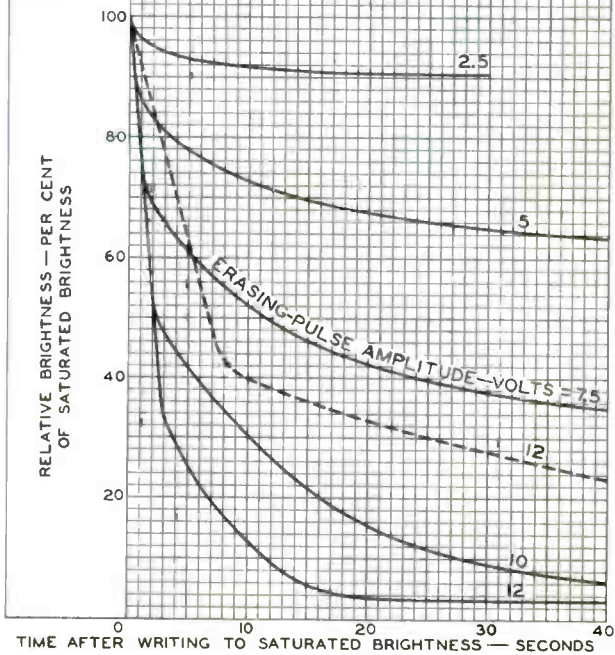
VIEWING SECTION

E_f = 6.3 VOLTS
SCREEN VOLTS * = 8500
BACKPLATE VOLTS * = 0
GRID-№5 VOLTS * = 250
GRID-№4 VOLTS } ADJUSTED
GRID-№3 VOLTS } FOR BEST
GRID-№1 VOLTS } COLLIMATION.
GRID-№2 VOLTS * = 100

* REFERRED TO CATHODE OF VIEWING GUN.

ERASING CONDITIONS

PULSE SHAPE; RECTANGULAR
PULSE DURATION; 10 μ SEC. APPROX.
PULSE REPETITION FREQUENCY:
——— CURVES: 2000 PPS
– – – CURVE : 500 PPS



7315
DISPLAY STORAGE TUBE

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	6.3	volts
Current	0.6	0.6	amp
Minimum Cathode Heating Time before other electrode voltages are applied	–	30	sec
Direct Interelectrode Capacitances (Approx.):[o]			
Grid No.1 to all other tube electrodes	6.5	11	μμf
Cathode to all other tube electrodes	5.5	8	μμf
Backplate to all other tube electrodes	–	116	μμf
Deflecting electrode DJ_1 to deflecting electrode DJ_2	1.9	–	μμf
Deflecting electrode DJ_3 to deflecting electrode DJ_4	2	–	μμf
DJ_1 to all other tube electrodes	6	–	μμf
DJ_2 to all other tube electrodes	7	–	μμf
DJ_3 to all other tube electrodes	5.5	–	μμf
DJ_4 to all other tube electrodes	4.8	–	μμf
Focusing Method	Electrostatic	None	
Deflection Method	Electrostatic	None	
Deflecting-Electrode Arrangement	*See Dimensional 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" ± 0.39"
Greatest Bulb Diameter	5.25" ± 0.06"
Maximum Tube Radius	2.69"
Bulb Terminals:	
Caps (Three)	Recessed Small Ball (JEDEC No.J1-22)
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Temperature Range:	
Operating	-65° to +100° C
Storage	-55° to +85° C
Operating Position	Any
Weight (Approx.)	2-3/4 lbs
Base	Medium-Shell Diheptal 14-Pin (JEDEC Group 5, No.B14-38)

ELECTRON TUBE DIVISION
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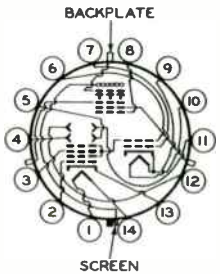
TENTATIVE DATA 1

7315

DISPLAY STORAGE TUBE

BOTTOM VIEW



Pin 1 – Heater of Writing Gun
Pin 2 – Grid No.1 of Writing Gun
Pin 3 – Grid No.3 of Writing Gun
Pin 4 – Deflecting Electrode DJ_3 of Writing Gun
Pin 5 – Deflecting Electrode DJ_4 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 10 – Heater and Cathode of Viewing Gun
Pin 11 – Deflecting Electrode DJ_1 of Writing Gun
Pin 12 – Deflecting Electrode DJ_2 of Writing Gun
Pin 13 – Cathode of Writing Gun
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 Section		Viewing Section	
SCREEN VOLTAGE.	–		11000 max.**	volts
BACKPLATE VOLTAGE (Peak). .	–		20 max.**	volts
	Equivalent Values		*Equivalent Values*	
GRID-No.5 VOLTAGE	–	–	– 300 max.**	volts
GRID-No.4 VOLTAGE	2950 max.*▲	200 max.**	– 300 max.**	volts
GRID-No.3 VOLTAGE	1200 max.*	-1550 max.**	– {200 max.** / 10 min.**}	volts
PEAK VOLTAGE BETWEEN GRID No.3 AND GRIDS No.2 & No.4.	–	2950 max.	– –	volts

ELECTRON TUBE DIVISION
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TENTATIVE DATA 1

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DISPLAY STORAGE TUBE

	Writing Section		Viewing Section		
GRID-No.2 VOLTAGE	2950 max.*▲	200 max.**	2950 max.*▲	200 max.**	volts
CATHODE VOLTAGE	–	-2750 max.**	–	–	volts
GRID-No.1 VOLTAGE:					
Negative-bias value		200 max.*		200 max.**	volts
Positive-bias value		0 max.*		0 max.**	volts
Positive-peak value		2 max.*		0 max.**	volts
PEAK VOLTAGE BETWEEN GRIDS No.2 & No.4 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

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 Voltage	10000	10000	volts
Backplate Voltage (DC)	2	2	volts
Grid-No.5 Voltage	210	150	volts
Grid-No.4 Voltage#	50 to 150	30 to 90	volts
Grid-No.3 Voltage#	30 to 50	10 to 40	volts
Grid-No.2 Voltage▲	150	125	volts
Grid-No.1 Voltage#	0 to -80	0 to -60	volts
Maximum Screen Current	0.75	0.5	ma
Maximum Backplate Current (Peak)	2	1.5	ma
Maximum Grid-No.5 Current	3	2.5	ma
Maximum Grid-No.4 Current	3	2.5	ma
Maximum Grid-No.3 Current	5	4	ma

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DISPLAY STORAGE TUBE

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▲▲	20	40	sec
Maximum Erasing–Uniformity Factor□□ . . .	0.45	0.4	
Resolution◆	50	50	lines/in.
Brightness◆◆	2750	1500	fl

WRITING SECTION●

Range Values for Equipment Design:*

For any grids–No.2 & No.4 voltage ($E_{c_{2+4}}$) between 1500 and 2750 volts▲

Grid–No.3 Voltage for focus.	17.5% to 37.5% of $E_{c_{2+4}}$	volts
Maximum Grid–No.1 Voltage for cutoff of undeflected focused spot	–4.6% of $E_{c_{2+4}}$	volts
Maximum Grid–No.3 Current.	–15 to +10	μa
Maximum Cathode Current.	*See Curve*	
Deflection Factors:		
DJ_1 & DJ_2.	36 to 48	v dc/in./kv of $E_{c_{2+4}}$
DJ_3 & DJ_4.	35 to 47	v dc/in./kv of $E_{c_{2+4}}$
Focused Beam Position. .	##	
Writing Speed††	3000	in./sec

Examples of Use of Design Ranges:*

For grids–No.2 & No.4 voltage ($E_{c_{2+4}}$)▲	*2000*	*volts*
Grid–No.3 Voltage for focus.	350 to 750	volts
Maximum Grid–No.1 Voltage for cutoff of undeflected focused spot.	–92	volts
Deflection Factors:		
DJ_1 & DJ_2.	72 to 96	volts
DJ_3 & DJ_4.	70 to 94	volts

Equivalent Values of Writing–Gun Voltages Referred to Cathode of Viewing Gun:

Cathode Voltage.	–1875	–1850	volts
Grid–No.3 Voltage for focus.	–1125 to –1525	–1100 to –1500	volts
Grids–No.2 & No.4 Voltage▲ .	+125	+150	volts

VIEWING SECTION and WRITING SECTION

Circuit Values:

Grid–No.1–Circuit Resistance (Either gun).	1 max.	megohm
Resistance in Any Deflecting–Electrode Circuit■. .	0.1 max.	megohm
Series Current–Limiting Resistor (Unbypassed) in Grid–No.5 (Viewing–Section) Circuit	0.01 min.	megohm

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DISPLAY STORAGE TUBE

Backplate-Circuit Resistance.	0.005 max.	megohm
Series Current-Limiting Resistance in Screen Circuit.	1 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 to grid No.2 of Viewing Gun within the tube.

Adjusted for brightest, most uniform pattern.

□ 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 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 viewing diameter is reduced to background-brightness level, and time (t_2) 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 $(t_2 - t_1)/t_2$.

◆ 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 Writing Gun at +2000 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.

†† Measured under conditions of writing from just zero brightness (viewing-beam 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 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.

RCA

7315

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 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 grounded.

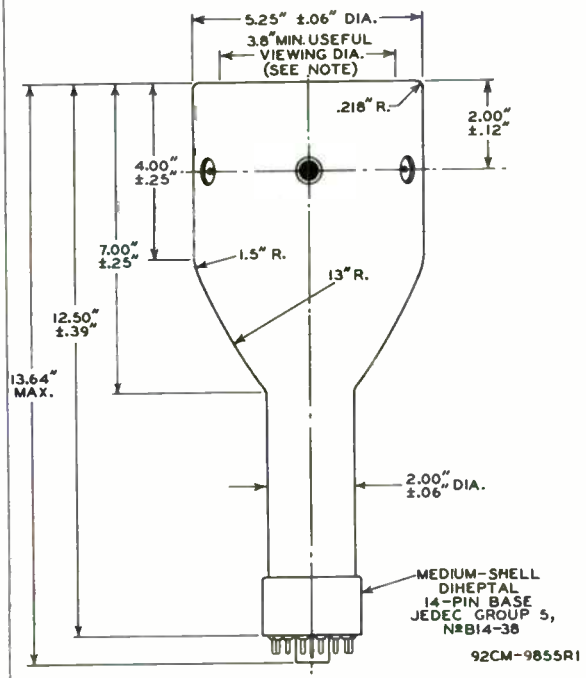
To prevent possible damage to the tube, allow the Viewing-Gun beam current to reach normal operating value before turning on the Writing-Gun beam current, and keep the viewing beam on till the writing beam is turned off.

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.

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

7315

DISPLAY STORAGE TUBE



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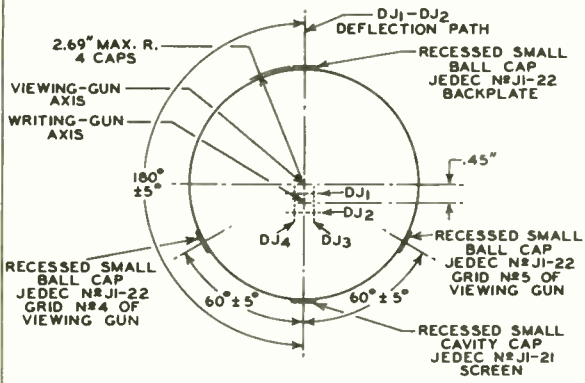
DISPLAY STORAGE TUBE

TOP VIEW



NOTE: MINIMUM USEFUL 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 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

DEFLECTING ELECTRODES DJ_1 AND DJ_2 ARE NEARER THE SCREEN; DEFLECTING ELECTRODES 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 8; LIKEWISE, WITH DJ_3 POSITIVE WITH RESPECT TO 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 $\pm\ 10^{\circ}$. ANGLE BETWEEN $DJ_1 - DJ_2$ DEFLECTION PATH AND $DJ_3 - DJ_4$ DEFLECTION PATH IS $90^{\circ} \pm 3^{\circ}$.

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 $\pm\ 10^{\circ}$.

ELECTRON TUBE DIVISION
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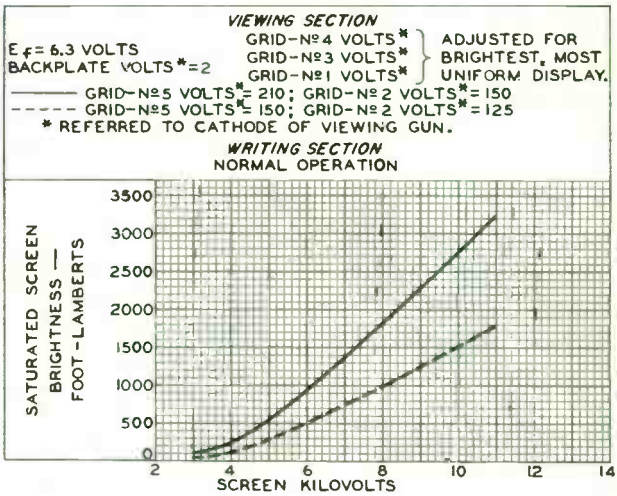
RCA

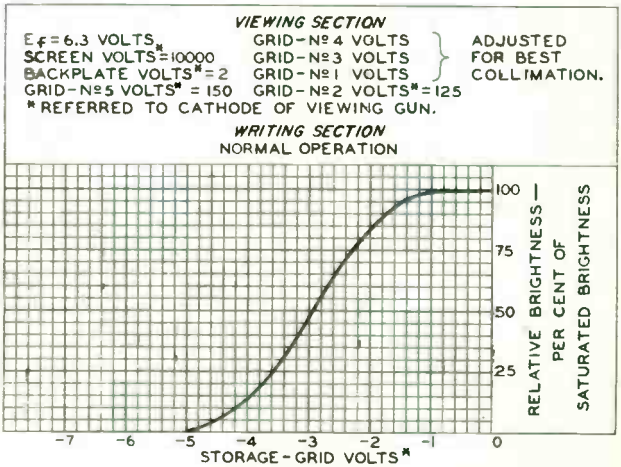
7315

TYPICAL CHARACTERISTICS



92CS-9858

TYPICAL STORAGE-GRID CHARACTERISTIC



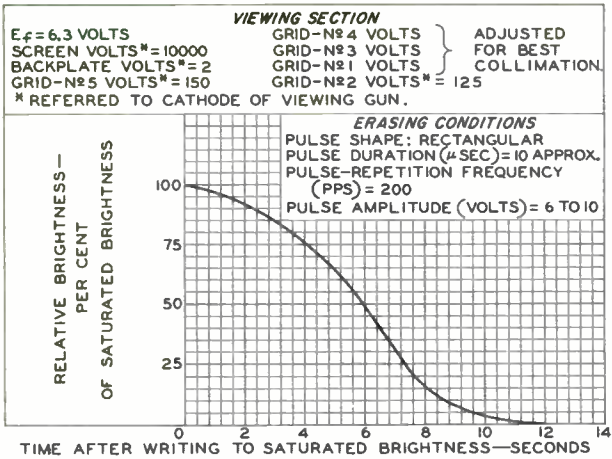
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

92CS-9861

RCA

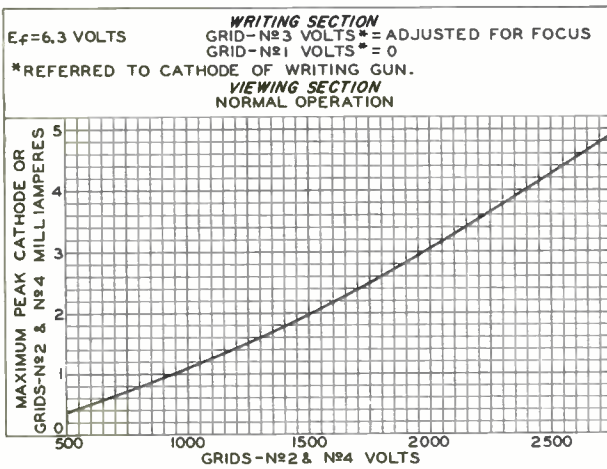
7315

TYPICAL ERASURE CHARACTERISTIC



92CS-9860

WRITING-GUN-CURRENT CHARACTERISTIC



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

92CS-9859

7448

DISPLAY STORAGE TUBE

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	6.3	volts
Current	0.6	0.6	amp
Minimum Cathode Heating Time before other electrode voltages are applied.	–	30	sec
Direct Interelectrode Capacitances (Approx.):[o]			
Grid No.1 to all other tube electrodes	6.5	11	μμf
Cathode to all other tube electrodes	5.5	8	μμf
Backplate to all other tube electrodes	–	116	μμf
Deflecting electrode DJ_1 to deflecting electrode DJ_2	1.9	–	μμf
Deflecting electrode DJ_3 to deflecting electrode DJ_4	2	–	μμf
DJ_1 to all other tube electrodes.	6	–	μμf
DJ_2 to all other tube electrodes.	7	–	μμf
DJ_3 to all other tube electrodes.	5.5	–	μμf
DJ_4 to all other tube electrodes.	4.8	–	μμf
Focusing Method	Electrostatic	None	
Deflection Method	Electrostatic	None	
Deflecting-Electrode Arrangement.	*See Dimensional 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" ± 0.39"
Greatest Bulb Diameter. . . . . 5.25" ± 0.06"
Maximum Tube Radius . . . . . 2.69"
Bulb Terminals:
Caps (Three). . . . . Recessed Small Ball (JEDEC No.J1-22)
Cap . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Temperature Range:
Operating . . . . . −55° to +85° C
Storage . . . . . −65° to +100° C
Operating Position. . . . . Any
Weight (Approx.). . . . . 2-3/4 lbs
Base. . . . . Medium-Shell Diheptal 14-Pin (JEDEC Group 5, No.B14-38)

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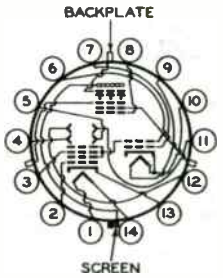
DISPLAY STORAGE TUBE

BOTTOM VIEW



Pin 1—Heater of Writing Gun
Pin 2—Grid No.1 of Writing Gun
Pin 3—Grid No.3 of Writing Gun
Pin 4—Deflecting Electrode DJ_3 of Writing Gun
Pin 5—Deflecting Electrode DJ_4 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 10—Heater and Cathode of Viewing Gun
Pin 11—Deflecting Electrode DJ_1 of Writing Gun
Pin 12—Deflecting Electrode DJ_2 of Writing Gun
Pin 13—Cathode of Writing Gun
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 Section		Viewing Section		
SCREEN VOLTAGE.	–		11000 max.**		volts
BACKPLATE VOLTAGE (Peak). .	–		20 max.**		volts
	Equivalent Values		*Equivalent Values*		
GRID-No.5 VOLTAGE	–	–	–	300 max.**	volts
GRID-No.4 VOLTAGE	2950 max.*▲	200 max.**	–	300 max.**	volts
GRID-No.3 VOLTAGE	1200 max.*	-1550 max.**	–	200 max.** / 10 min.**	volts
PEAK VOLTAGE BETWEEN GRID No.3 AND GRIDS No.2 & No.4.	–	2950 max.	–	–	volts

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	Writing Section		Viewing Section		
GRID-No.2 VOLTAGE	2950 max.*▲	200 max.**	2950 max.*▲	200 max.**	volts
CATHODE VOLTAGE	–	-2750 max.**	–	–	volts
GRID-No.1 VOLTAGE:					
Negative-bias value	200 max.*		200 max.**		volts
Positive-bias value	0 max.*		0 max.**		volts
Positive-peak value	2 max.*		0 max.**		volts
PEAK VOLTAGE BETWEEN GRIDS No.2 & No.4 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

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 Voltage	10000	10000	volts
Backplate Voltage (DC)	2	2	volts
Grid-No.5 Voltage	210	150	volts
Grid-No.4 Voltage#	50 to 150	30 to 90	volts
Grid-No.3 Voltage#	10 to 50	10 to 40	volts
Grid-No.2 Voltage▲	150	125	volts
Grid-No.1 Voltage#	0 to -80	0 to -60	volts
Maximum Screen Current	0.75	0.5	ma
Maximum Backplate Current (Peak)	2	1.5	ma
Maximum Grid-No.5 Current	3	2.5	ma
Maximum Grid-No.4 Current	3	2.5	ma
Maximum Grid-No.3 Current	5	4	ma

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DISPLAY STORAGE TUBE

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[▲▲]	20	40	sec
Maximum Erasing-Uniformity Factor[□□]	0.45	0.4	
Resolution[◆]	50	50	lines/in.
Brightness[◆◆]	2750	1500	fl

WRITING SECTION[●]

Range Values for Equipment Design:*

For any grids-No.2 & No.4 voltage ($E_{c_{2+4}}$) between 1500 and 2750 volts[▲]

Grid-No.3 Voltage for focus	17.5% to 37.5% of $E_{c_{2+4}}$	volts
Maximum Grid-No.1 Voltage for cutoff of undeflected focused spot	-4.6% of $E_{c_{2+4}}$	volts
Maximum Grid-No.3 Current	-15 to +10	μa
Maximum Cathode Current	*See Curve*	
Deflection Factors:		
DJ_1 & DJ_2	36 to 48	v dc/in./kv of $E_{c_{2+4}}$
DJ_3 & DJ_4	35 to 47	v dc/in./kv of $E_{c_{2+4}}$
Focused Beam Position	##	
Writing Speed[††]	300000	in./sec

Examples of Use of Design Ranges:*

For grids-No.2 & No.4 voltage ($E_{c_{2+4}}$)[▲]	*2000*	*volts*
Grid-No.3 Voltage for focus	350 to 750	volts
Maximum Grid-No.1 Voltage for cutoff of undeflected focused spot	-92	volts
Deflection Factors:		
DJ_1 & DJ_2	72 to 96	volts
DJ_3 & DJ_4	70 to 94	volts

Equivalent Values of Writing-Gun Voltages Referred to Cathode of Viewing Gun:

Cathode Voltage	-1850	-1875	volts
Grid-No.3 Voltage for focus	-1100 to -1500	-1125 to -1525	volts
Grids-No.2 & No 4 Voltage[▲]	+150	+125	volts

VIEWING SECTION and WRITING SECTION

Circuit Values:

Grid-No.1-Circuit Resistance (Either gun)	1 max.	megohm
Resistance in Any Deflecting-Electrode Circuit[■]	0.1 max.	megohm
Series Current-Limiting Resistor (Unbypassed) In Grid-No.5 (Viewing-Section) Circuit	0.01 min.	megohm

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Backplate–Circuit Resistance.	0.005 max. megohm
Series Current–Limiting Resistance in Screen Circuit.	1 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 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.4 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_1) from start of erasing to the instant at which any area within the minimum useful viewing diameter is reduced to background–brightness level, and time (t_2) 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 $(t_2 - t_1)/t_2$.

♣ 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 Writing Gun at +2000 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.

†† Measured under conditions of writing from just zero brightness (viewing–beam 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 1/16–inch thick is usually satisfactory.

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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 connectors.

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 grounded.

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.

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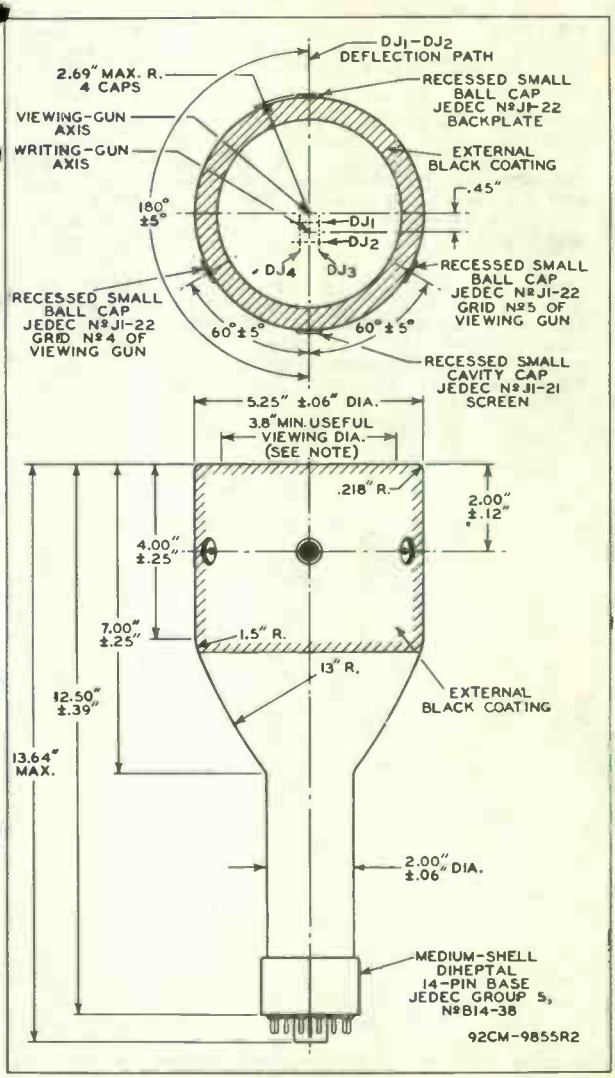

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NOTE: MINIMUM USEFUL VIEWING AREA MAY BE ECCENTRIC WITH RESPECT TO THE TUBE FACE. THE MINIMUM USEFUL VIEWING AREA WILL HAVE DIAMETER OF 3.8".

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

DEFLECTING ELECTRODES DJ_1 AND DJ_2 ARE NEARER THE SCREEN: DEFLECTING ELECTRODES 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 8; LIKEWISE, WITH DJ_3 POSITIVE WITH RESPECT TO 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 ± 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 ± 10°. ANGLE BETWEEN DJ_1 – DJ_2 DEFLECTION PATH AND DJ_3 – DJ_4 DEFLECTION PATH IS 90° ± 3°.

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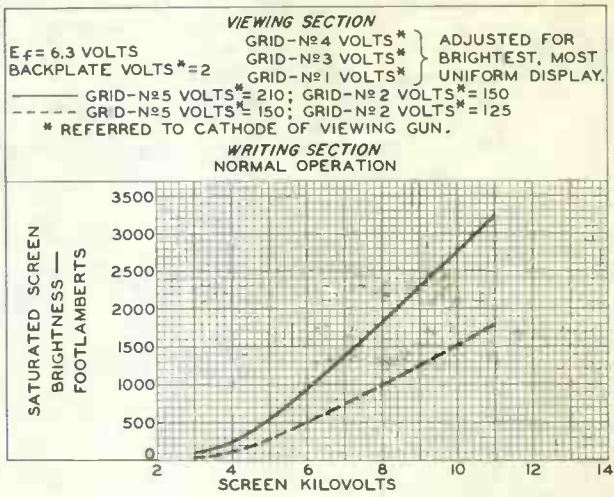
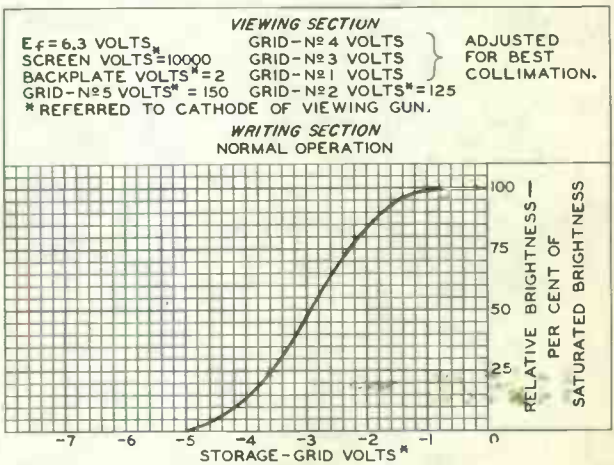
TYPICAL CHARACTERISTICS



92CS-9858

TYPICAL STORAGE-GRID CHARACTERISTIC



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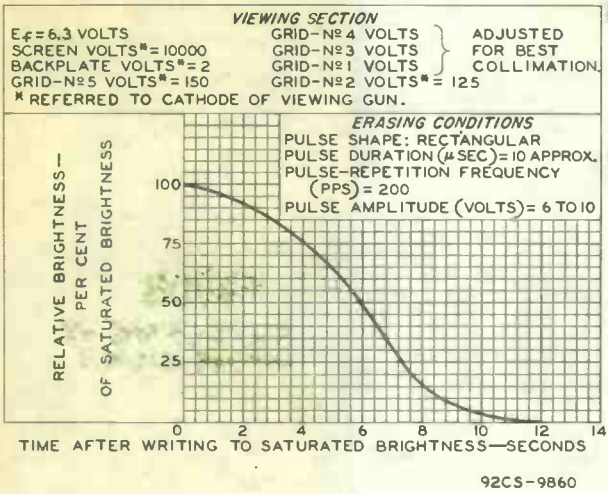
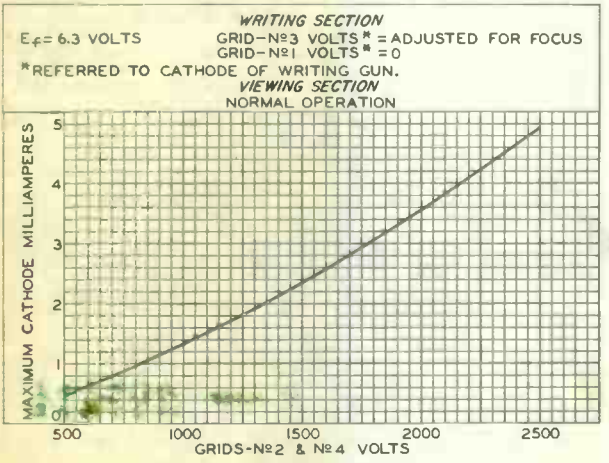
TYPICAL ERASURE CHARACTERISTIC



92CS-9860

WRITING-GUN-CURRENT CHARACTERISTIC



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