
**RCA TUBE
HANDBOOK
HB-3**



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

**Cathode-Ray Tubes, Storage
Tubes, & Monoscopes**

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.*



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

When choosing tube types, the equipment designer should refer to the RCA PREFERRED TYPES LIST and its companion list - TYPES NOT RECOMMENDED FOR NEW EQUIPMENT DESIGN - both of which appear in the General Section.

PICTURE TUBES

BLACK-AND-WHITE TELEVISION TYPES

Round Metal-Shell

Magnetic Focus

16AP4-A

16GP4-B

19AP4-B

Rectangular Metal-Shell

Magnetic Focus

17CP4

21AP4

27MP4*

Electrostatic Focus

17GP4

17TP4

21MP4

Round Glass

Magnetic Focus

10BP4-A

10FP4-A*

12KP4-A*

12LP4-A

16DP4-A

16LP4-A

16WP4-A

Electrostatic Focus

7JP4

Rectangular Glass

70° Deflection Angle (Diagonal)

Magnetic Focus

14EP4/14CP4/14BP4

16RP4/16KP4

16RP4-A/16KP4-A*

16TP4

17BP4-A

17BP4-B*

17QP4

17QP4-A*

20DP4-A/20CP4-A

20DP4-C/20CP4-D*

21EP4-A

21EP4-B*

21ZP4-A

21ZP4-B*

Electrostatic Focus

14HP4

14QP4-A

17HP4/17RP4

17HP4-B/17RP4-C*

17LP4/17VP4

17LP4-A/17VP4-B*

20HP4-A/20MP4

20HP4-D*

21FP4-A

21FP4-C*

21YP4

21YP4-A*

72° Deflection Angle (Diagonal)

Magnetic Focus

21AWP4*

Electrostatic Focus

21AVP4/21AUP4

21AVP4-B/21AUP4-B/

21AVP4-A/21AUP4-A*

* Type having aluminized screen.



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

PICTURE TUBES (Cont'd)

BLACK-AND-WHITE TELEVISION TYPES

Rectangular Glass

90° Deflection Angle (Diagonal)

Magnetic Focus

21ACP4-A/21BSP4/21AMP4-A*
24ADP4/24VP4-A/
24CP4-A/24TP4*

Electrostatic Focus

8DP4
14ATP4*
14RP4
14RP4-A*
14WP4/14ZP4*
17AVP4/17ATP4
17AVP4-A/17ATP4-A*
17BJP4*
21ALP4
21ALP4-B/21ALP4-A*
21ATP4-A/21ATP4*
21BTP4*
21CBP4-A*
21DLP4*
24AEP4*
24DP4-A/24YP4*

110° Deflection Angle (Diagonal)

Electrostatic Focus

17BWP4*	21DAP4*
17BZP4*	21DFP4*
17CDP4*	24AHP4*
21CEP4*	

COLOR-TELEVISION TYPES

Round Metal-Shell

21AXP22*
21AXP22-A*

Round Glass

15GP22*
21CYP22*

* Type having aluminized screen.



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

SPECIAL-PURPOSE KINESCOPIES					
Approx. Bulb Dia. Inches	Focusing Method	Deflection Method	Minimum Screen Size Inches	Maximum Ultron 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.					



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

FLYING-SPOT CATHODE-RAY TUBES

Approx. Bulb Dia. Inches	Focus- ing Method	Deflec- tion 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	Focus- ing Method	Deflec- tion 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.



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

OSCILLOGRAPH TUBES							
Phos- phor □	Approx. Bulb Dia. Inches	Max. Ultor Volts ⊕	TUBE TYPE	Phos- phor □	Approx. Bulb Dia. Inches	Max. Ultor Volts ⊕	TUBE TYPE
Electrostatic-Deflection & Focus Types							
P1	1	1500	1EP1	P7	5	2500	5UP7
P1	2	600	902-A	P11	1	1500	1EP11
P1	2	1000	2AP1-A	P11	2	2500	2BP11
P1	2	2500	2BP1	P11	3	2500	3KP11
P1	3	1500	3AP1-A	P11	3	2500	3WP11
P1	3	2000	3BP1-A	P11	5	2500	5UP11
P1	3	2500	3KP1	<i>Post-Deflection Accelerator Types</i>			
P1	3	2500	3RP1	P1	3	4000 ●	3JP1
P1	3	2500	3RP1-A ▲	P1	5	6000 ●	5ABP1
P1	3	2500	3WP1	P1	5	6000 ●	5ADP1
P1	5	2000	5BP1-A	P1	5	4000 ●	5CP1-A
P1	5	2500	5UP1	P4	5	6000 ●	5ABP4
P1	7	4000	7VP1	P7	3	4000 ●	3JP7
P2	1	1500	1EP2	P7	5	6000 ●	5ABP7
P2	3	2500	3WP2	P7	5	4000 ●	5CP7-A
P4	3	2500	3KP4	P11	5	6000 ●	5ABP11
P4	3	2500	3RP4	P11	5	4000 ●	5CP11-A
P5	3	1500	908-A	P12	5	4000 ●	5CP12
P7	3	2500	3KP7				
Magnetic-Deflection Types							
<i>Magnetic-Focus Types</i>				<i>Electrostatic-Focus Types</i>			
P7	5	8000	5FP7-A	P1	7	8000	7CP1
P7	7	8000	7BP7-A	P7	5	10000	5AHP7
P7	7	8000	7MP7	P7	5	10000	5AHP7-A ●
P7	10	10000	10KP7				
P7	12	10000	12DP7-A				
P7	16	14000	16ADP7				
P14	5	8000	5FP14				
P14	5	8000	5FP14-A ■				
P14	7	8000	7MP14				
P15	5	8000	5FP15-A				

⊕ Design-center values.

□ See sheet FEATURES OF FLUORESCENT SCREENS.

▲ Similar to Type 3RP1 except for flat faceplate.

● Maximum post-ultor volts.

■ Similar to Type 5FP14 except for high-resolution capability.

● Similar to Type 5AHP7 except for aluminized screen.



Picture-Tube Replacement Guide

Bold-Face Type Indicates an Aluminized Tube

Type to be Replaced	Replace by RCA Type [▲]	Type to be Replaced	Replace by RCA Type [▲]
5TP4	5TP4	14QP4	14QP4A
7JP4	7JP4	14QP4A	
8DP4	8DP4	14RP4	
10BP4	10BP4A	14RP4A	●14WP4
10BP4A		14SP4	
10BP4C		14UP4	●14EP4
10BP4D	●10FP4A	14WP4	
10CP4		14WP4/	
10EP4	●10BP4A	14ZP4	14WP4
10FP4	10FP4A	14ZP4	
10FP4A		14ZP4/	
12JP4	●12KP4A	14WP4	
12KP4		16AP4	16AP4A
12KP4/		16AP4A	
12ZP4	12KP4A	16CP4	●16LP4A
12KP4A		16DP4	16DP4A
12LP4		16DP4A	
12LP4A	12LP4A	16GP4	
12LP4C		16GP4A	16GP4B
12LP4C		16GP4B	
12QP4	●12KP4A	16GP4C	
12QP4A		16KP4	16RP4A
12TP4	●12LP4A	16KP4A	
12ZP4	●12KP4A	16LP4	16LP4A
12ZP4A		16LP4A	
14ATP4	14ATP4	16QP4	●16RP4A
14BAP4	14BAP4	16RP4	
14BP4		16RP4/	
14BP4A	14EP4	16KP4	16RP4A
14CP4		16RP4A	
14CP4A		16RP4A/	
14DP4	●14EP4	16KP4A	
14EP4		16SP4	●16WP4A
14EP4/		16SP4A	
14CP4	14EP4	16TP4	16TP4
14EP4/		16UP4	●16RP4A
14CP4/		16VP4	
14BP4	14HP4	16WP4	●16WP4A
14HP4		16WP4/	
14NP4	●14WP4	16YP4	
14NP4A		16WP4A	16WP4A

- ▲ The RCA type shown is a direct replacement unless otherwise indicated.
 ● Minor electrical and/or mechanical set modification may be required.



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

REPLACEMENT
 GUIDE I
 I-62

Picture-Tube Replacement Guide

Bold-Face Type Indicates an Aluminized Tube

Type to be Replaced	Replace by RCA Type [▲]
16WP4B	16WP4A
16XP4	● 16RP4A
16YP4	●16WP4A
16ZP4	●16LP4A
17AP4	● 17BP4B
17ATP4	
17ATP4 / 17AVP4	
17ATP4A	
17ATP4A / 17AVP4A	● 17BJP4
17AVP4	
17AVP4 / 17ATP4	
17AVP4A	
17AVP4A / 17ATP4A	
17BJP4	17BJP4
17BP4	● 17BP4B
17BP4A	
17BP4B	17BP4B
17BP4C	
17BRP4	● 17BZP4
17BUP4	● 17BJP4
17BVP4	● 17CSP4
17BWP4	17CSP4
17BZP4	
17BZP4 / 17CAP4 / 17CKP4	
17BZP4 / 17CAP4 / 17CKP4 / 17BRP4	17BZP4
17CAP4	
17CBP4	● 17BJP4
17CDP4	17CDP4
17CFP4	17CFP4
17CKP4	17BZP4
17CLP4	● 17BJP4
17CP4	
17CP4A	17CP4

Type to be Replaced	Replace by RCA Type [▲]
17CSP4	17CSP4
17CWP4	17DSP4
17CYP4	17CYP4
17DAP4	17DAP4
17DKP4	17DKP4
17DLP4	17DSP4
17DQP4	17DQP4
17DSP4	17DSP4
17DTP4	17DKP4
17DWP4	17DWP4
17DXP4	17DXP4
17DZP4	
17GP4	17GP4
17HP4	
17HP4 / 17RP4	
17HP4A	17HP4B
17HP4B	
17HP4B / 17RP4C	
17JP4	17BP4B
17LP4	
17LP4 / 17VP4	
17LP4A	17LP4A
17LP4A / 17VP4B	
17QP4	17QP4A
17QP4A	
17RP4	17HP4B
17RP4C	
17TP4	17TP4
17UP4	17QP4A
17VP4	
17VP4 / 17LP4	17LP4A
17VP4B	
17YP4	17QP4A
19AFP4	19AFP4
19AJP4	19AJP4
19ANP4	19ANP4

[▲] The RCA type shown is a direct replacement unless otherwise indicated.

● Minor electrical and/or mechanical set modification may be required.



Picture-Tube Replacement Guide

Bold-Face Type Indicates an Aluminized Tube

Type to be Replaced	Replace by RCA Type [▲]	Type to be Replaced	Replace by RCA Type [▲]
19AP4		21ACP4A/	
19AP4A		21AMP4A	
19AP4B	19AP4B	21ACP4A/	
19AP4C		21BSP4	21AMP4A
19AP4D		21ACP4A/	
19AVP4	19AVP4	21BSP4/	
19AXP4	19AYP4	21AMP4A	
19AYP4		21AFP4	●21YP4A
19BDP4	19BDP4	21ALP4	
19BFP4	19BFP4	21ALP4A	
19BTP4	19BTP4	21ALP4B	●21CBP4A
19XP4	19XP4	21ALP4B/	
19YP4	19YP4	21ALP4A	
20CP4		21AMP4	21AMP4A
20CP4A		21AMP4A	
20CP4B	●20DP4C	21ANP4	●21CBP4A
20CP4C		21ANP4A	
20CP4D		21AP4	21AP4
20DP4		21AQP4	●21AMP4A
20DP4A		21AQP4A	
20DP4A/ 20CP4A	20DP4C	21ASP4	●21XP4A
20DP4B	●20DP4C	21ATP4	
20DP4C		21ATP4A	
20DP4C/	20DP4C	21ATP4A/	●21CBP4A
20CP4D		21ATP4	
20HP4	●20HP4D	21ATP4B	
20HP4A		21AUP4	
20HP4A/ 20LP4	20HP4D	21AUP4A	
20HP4A/ 20MP4		21AUP4B	
20HP4B	●20HP4D	21AUP4B/	
20HP4C		21AUP4A	
20HP4D		21AVP4	
20LP4	20HP4D	21AVP4/ 21AUP4	21AVP4B
20MP4		21AVP4A	
21ACP4		21AVP4B	
21ACP4/ 21AMP4	21AMP4A	21AVP4B/	
21ACP4A		21AUP4B/	
		21AVP4A/	
		21AUP4A	
		21AWP4	21AWP4

- ▲ The RCA type shown is a direct replacement unless otherwise indicated.
● Minor electrical and/or mechanical set modification may be required.



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

REPLACEMENT
GUIDE 2
1-62

Picture-Tube Replacement Guide

Bold-Face Type Indicates an Aluminized Tube

Type to be Replaced	Replace by RCA Type [▲]	Type to be Replaced	Replace by RCA Type [▲]
21AYP4	21XP4A	21ESP4	21FAP4
21BAP4	21CBP4A	21FAP4	
21BNP4		21FDP4	21FDP4
21BSP4	21AMP4A	21FLP4	21CBP4A
21BTP4	●21CBP4A	21FP4	●21FP4C
21CBP4		21FP4A	21FP4C
21CBP4A		21FP4C	
21CBP4A/ 21CBP4/ 21CMP4	21CBP4A	21MP4	21MP4
21CBP4B		21WP4	21WP4A
21CEP4	21DFP4	21XP4	21XP4A
21CEP4A		21XP4A	
21CMP4	●21CBP4A	21YP4	21YP4A
21CQP4	21CQP4	21YP4A	
21CUP4	21AMP4A	21ZP4	●21ZP4B
21CVP4		21ZP4A	21ZP4B
21CWP4	●21CBP4A	21ZP4B	
21CXP4	21DSP4	23AFP4	23AFP4
21CZP4	●21DEP4A	23AHP4	23AHP4
21DAP4		23ALP4	23ALP4
21DEP4		23ANP4	23BKP4
21DEP4A	21DEP4A	23ASP4	23ASP4
21DEP4A/ 21DEP4/ 21CZP4		23AVP4	23AVP4
21DFP4	21DFP4	23AWP4	●23BJP4
21DHP4	21DHP4	23BDP4	23BDP4
21DLP4	21DLP4	23BJP4	23BJP4
21DMP4	21FAP4	23BKP4	23BKP4
21DNP4	●21CBP4A	23BLP4	23BLP4
21DQP4	21DLP4	23BTP4	23BTP4
21DSP4	21DSP4	23CBP4	23CBP4
21EAP4	●21FDP4	23CP4	23CP4
21EMP4	21EQP4	23CTP4	23CTP4
21EP4	●21EP4B	23EP4	23EP4
21EP4A		23FP4	23FP4
21EP4B	21EP4B	23GP4	23CP4
21EQP4	21EQP4	23HP4	
		23MP4	23MP4

▲ The RCA type shown is a direct replacement unless otherwise indicated.

● Minor electrical and/or mechanical set modification may be required.



Picture-Tube Replacement Guide

Bold-Face Type Indicates an Aluminized Tube

Type to be Replaced	Replace by RCA Type [▲]	Type to be Replaced	Replace by RCA Type [▲]
23UP4	23UP4	24DP4	
23WP4	23MP4	24DP4A	●24AEP4
23XP4		24DP4A/	
23YP4	23YP4	24YP4	
24ADP4		24QP4	●24CP4A
24ADP4/ 24VP4A/ 24CP4A/ 24TP4	24CP4A	24TP4	
		24VP4	24CP4A
24AEP4	24AEP4	24VP4A	
24AHP4	24AHP4	24XP4	●24CP4A
24ALP4	24AHP4	24YP4	●24AEP4
24ANP4	●24AEP4	24ZP4	24AEP4
24ATP4	24ATP4	27EP4	
24AUP4	24AUP4	27GP4	●27RP4
24BAP4	24BAP4	27MP4	27MP4
24CP4	24CP4A	27NP4	
		27RP4	27RP4
		27VP4	●27XP4
		27XP4	27XP4

- ▲ The RCA type shown is a direct replacement unless otherwise indicated.
 ● Minor electrical and/or mechanical set modification may be required.



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

REPLACEMENT
 GUIDE 3
 I-62





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-ultraviolet 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.

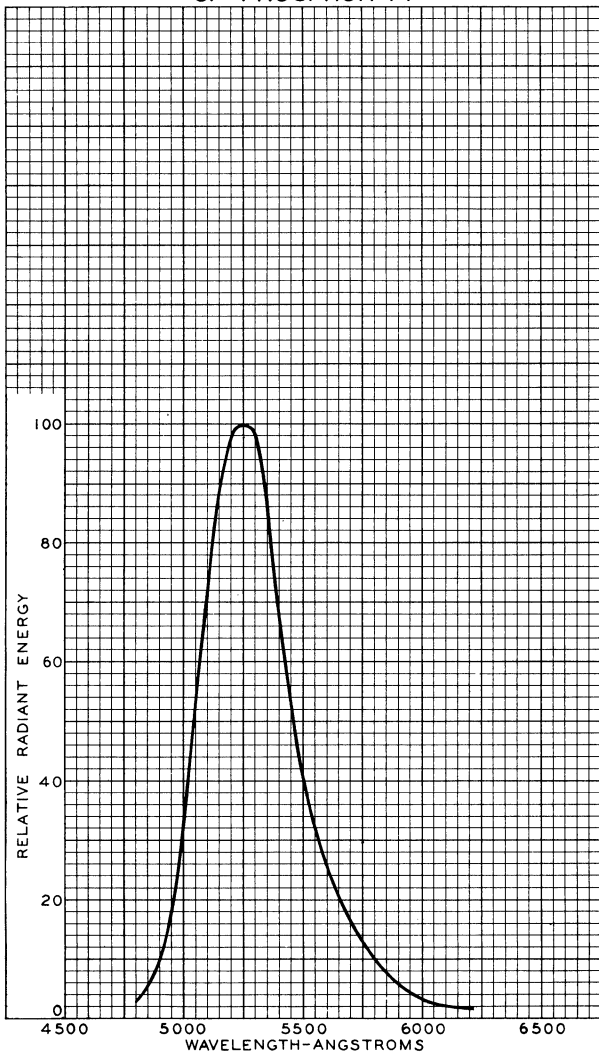
Phosphor P20 has high luminous efficiency, yellow-green fluorescence and medium-short persistence. The screen may be used in applications requiring relatively short persistence and good visual efficiency.

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.



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P1



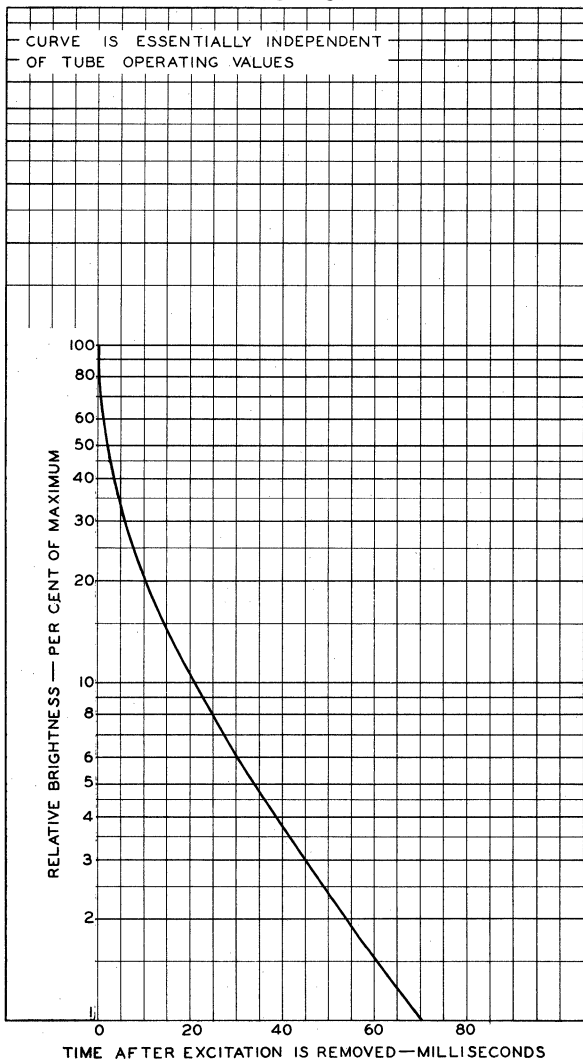
DEC.14,1948

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-5372RI

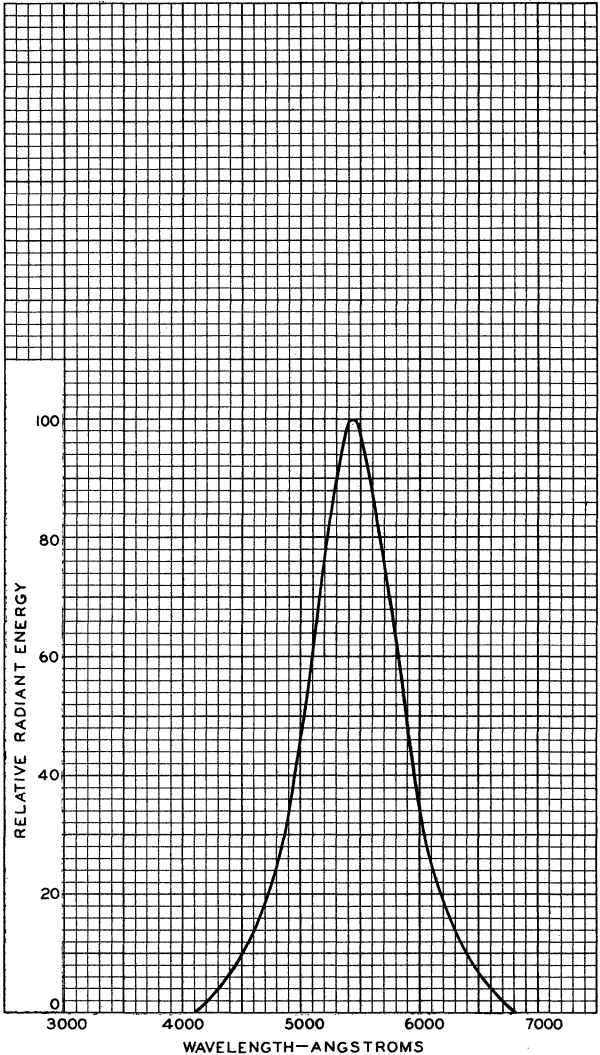


PERSISTENCE CHARACTERISTIC OF PHOSPHOR P1



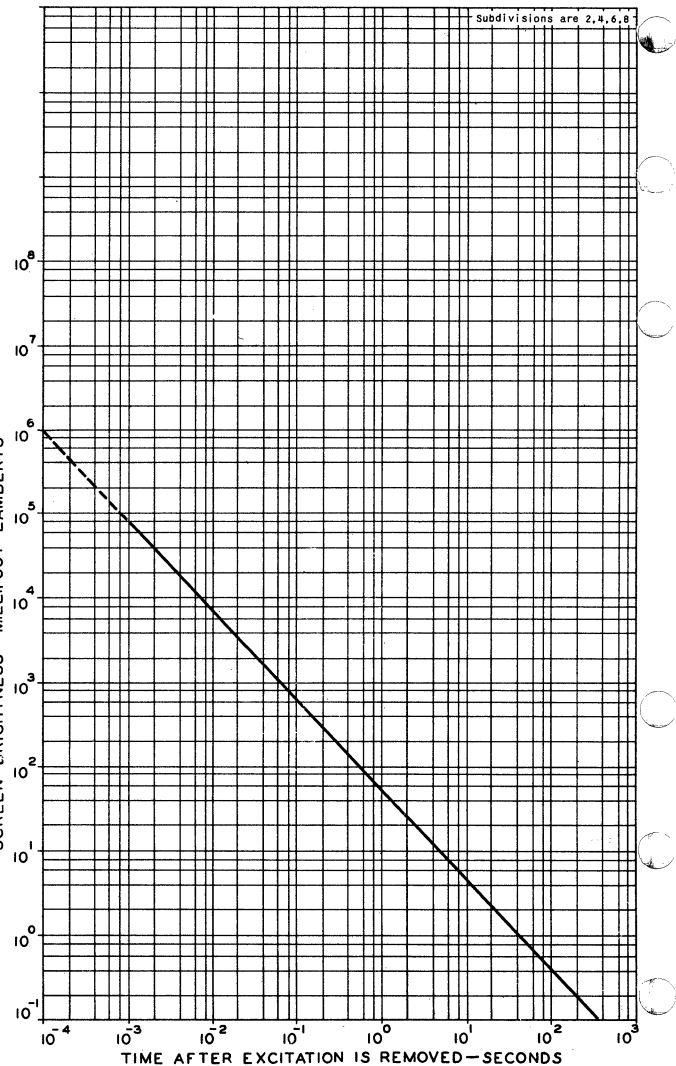


SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P2





PERSISTENCE CHARACTERISTIC OF PHOSPHOR P2



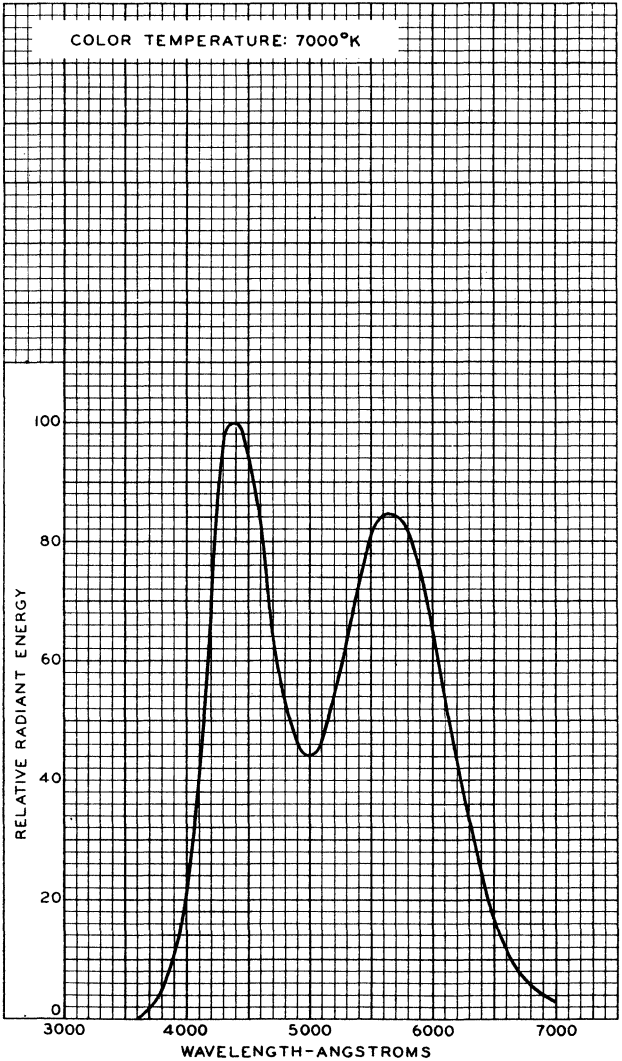
TUBE DIVISION

92CM-7321

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P4 SULFIDE TYPE





PERSISTENCE CHARACTERISTIC OF PHOSPHOR P4 SULFIDE TYPE

FOR KINESCOPES

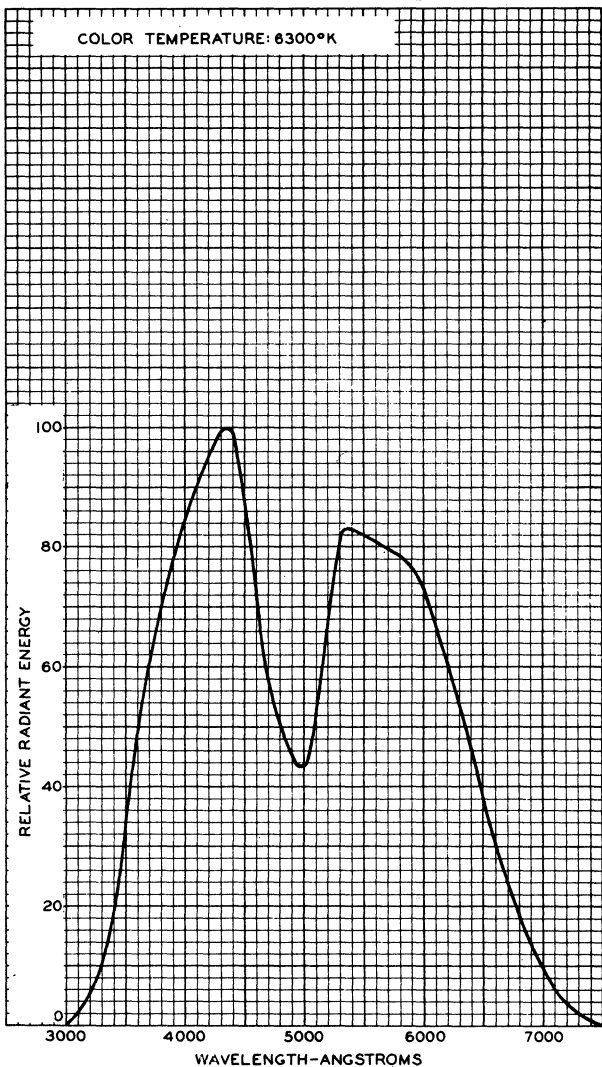
The persistence of the phosphorescence is such that its brightness does not exceed 7 per cent of the peak value in 33 milliseconds after excitation is removed.

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 №4 SILICATE-SULFIDE TYPE



MARCH 6, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7458



**PERSISTENCE CHARACTERISTIC
OF PHOSPOR N^o 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.

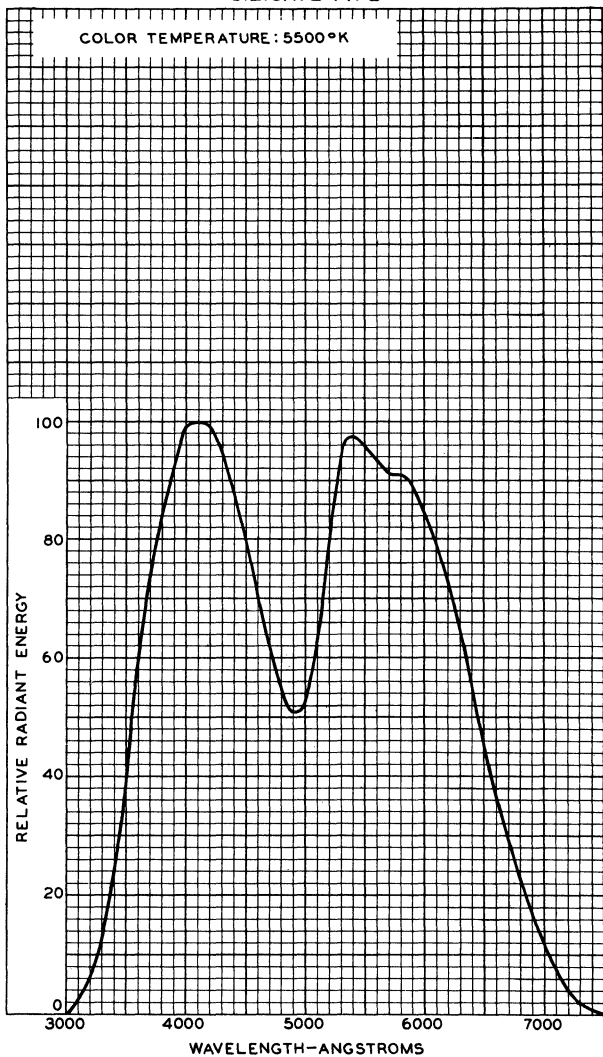
NOV. 1, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

PERSIST. P4
SIL.-SUL.



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P4 SILICATE TYPE



AUG. 2, 1949

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7335

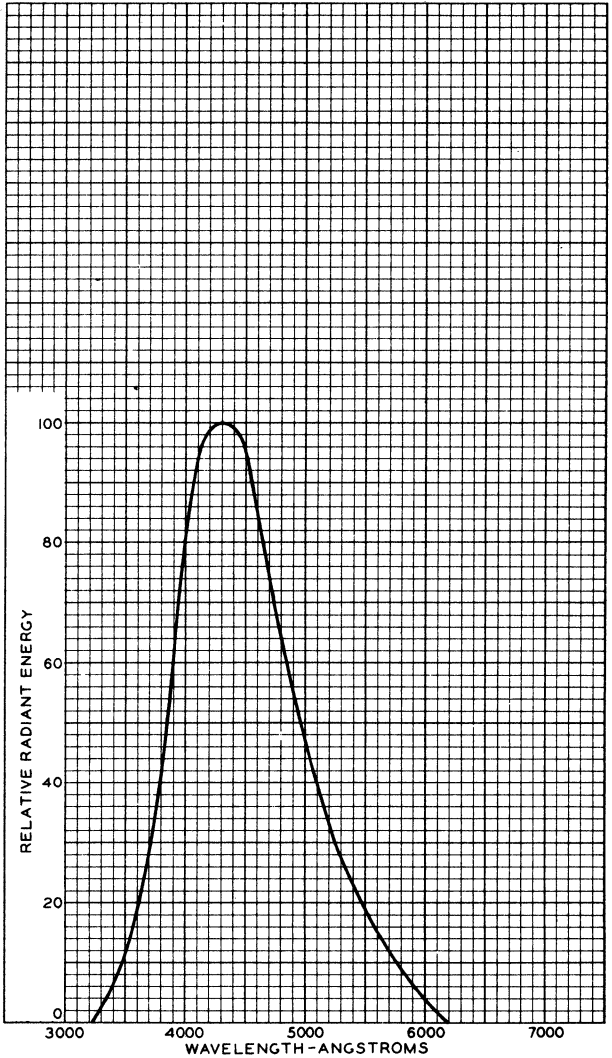


**PERSISTENCE CHARACTERISTIC
OF PHOSPOR P4
SILICATE TYPE**

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 № 5



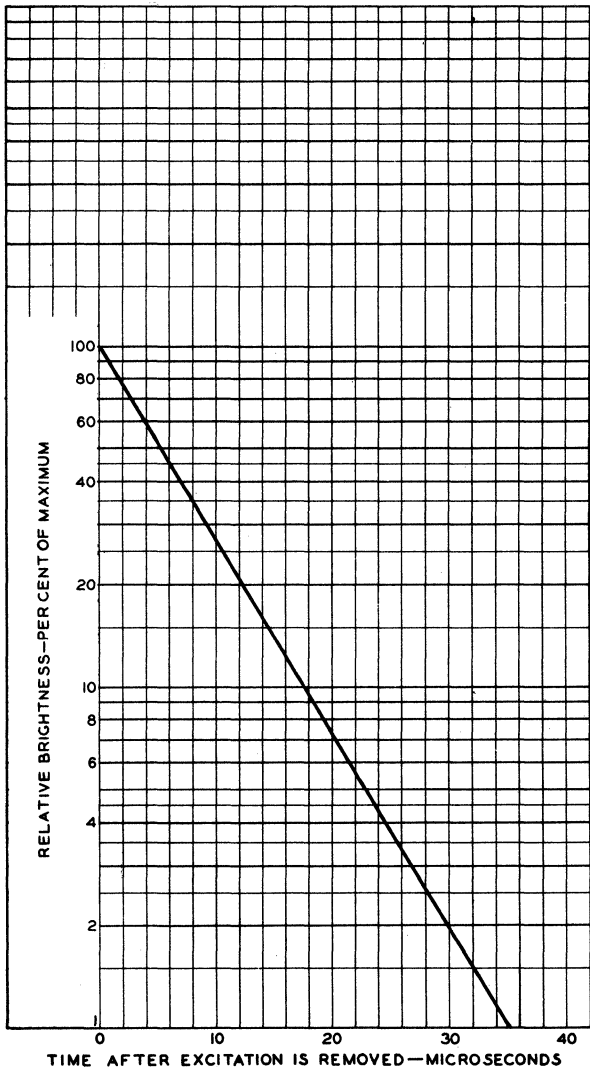
MAY 2, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-5559R2



PERSISTENCE CHARACTERISTIC OF PHOSPHOR № 5



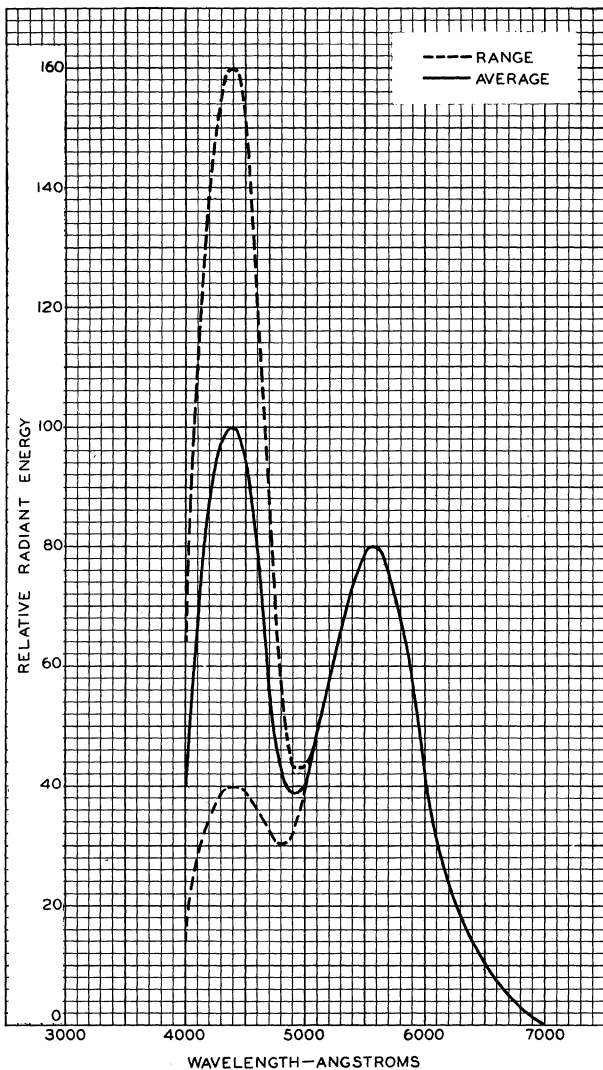
MAY 3, 1949

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7266



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P7

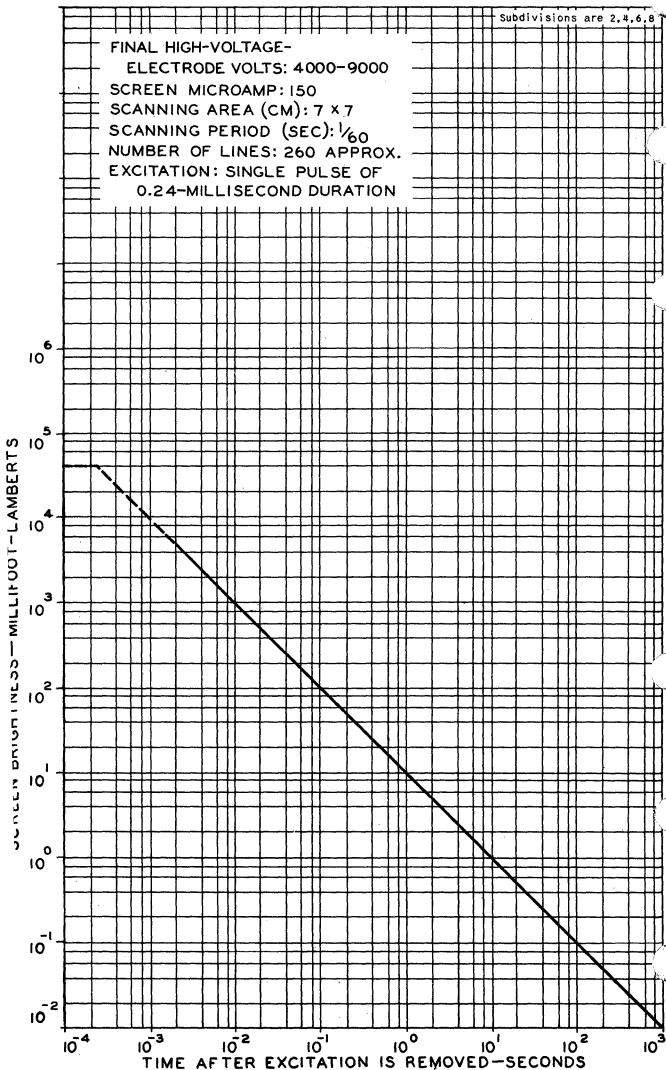




PERSISTENCE CHARACTERISTIC OF PHOSPHOR P7

FINAL HIGH-VOLTAGE-
ELECTRODE VOLTS: 4000-9000
SCREEN MICROAMP: 150
SCANNING AREA (CM): 7 x 7
SCANNING PERIOD (SEC): $\frac{1}{60}$
NUMBER OF LINES: 260 APPROX.
EXCITATION: SINGLE PULSE OF
0.24-MILLISECOND DURATION

Subdivisions are 2, 4, 6, 8

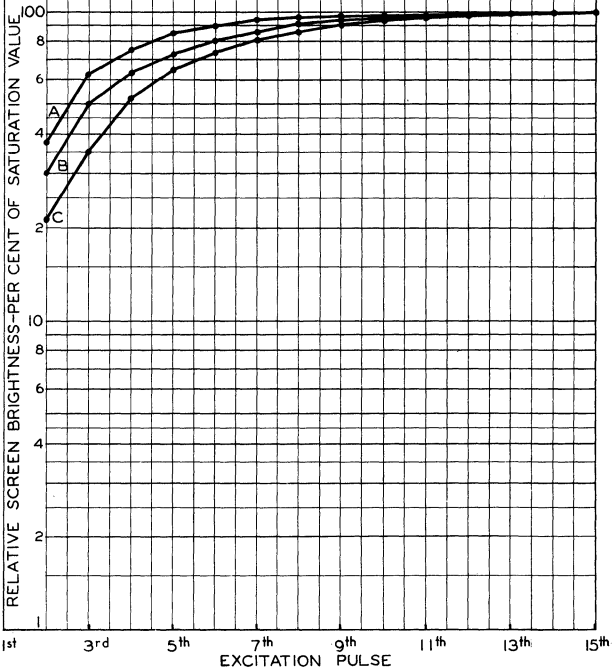




BUILDUP CHARACTERISTICS OF PHOSPHOR P7

FINAL HIGH-VOLTAGE-ELECTRODE VOLTS: 4000-9000
SCANNING AREA (CM): 7x7
NUMBER OF LINES: 260 APPROX.
EXCITATION: PULSE OF $\frac{1}{60}$ -SECOND DURATION
SUPPLIED TO GRID NO1 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

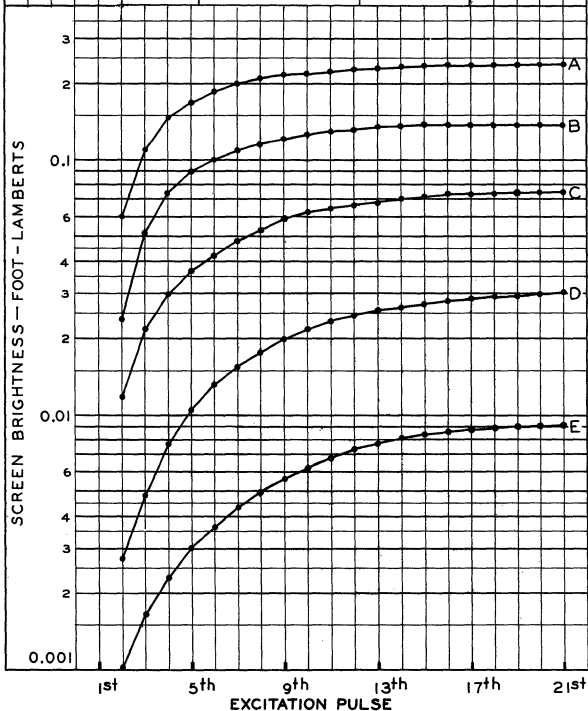




BUILDUP CHARACTERISTICS OF PHOSPHOR P7

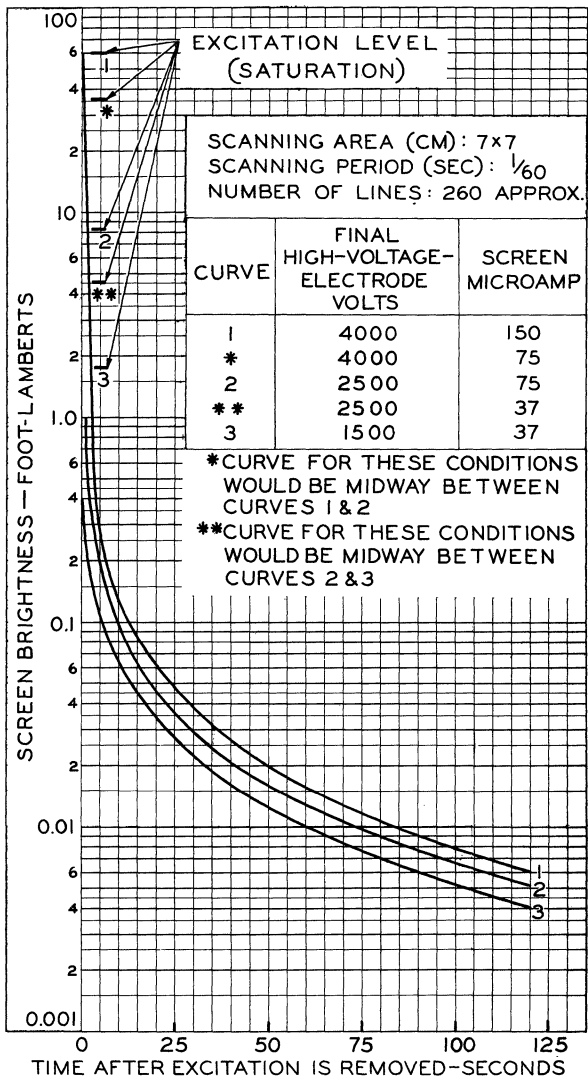
SCANNING AREA (CM): 7x7
NUMBER OF LINES: 260 APPROX.
EXCITATION: PULSE OF $\frac{1}{60}$ -SECOND DURATION SUPPLIED
TO GRID N^o1 OF CATHODE-RAY TUBE AT
1-SECOND INTERVALS FOR EACH OF THE
LOC1 UNDER THE INDICATED CONDITIONS.
BRIGHTNESS: MEASURED JUST BEFORE EACH EXCITATION
PULSE.

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





PERSISTENCE CHARACTERISTICS OF PHOSPHOR P7



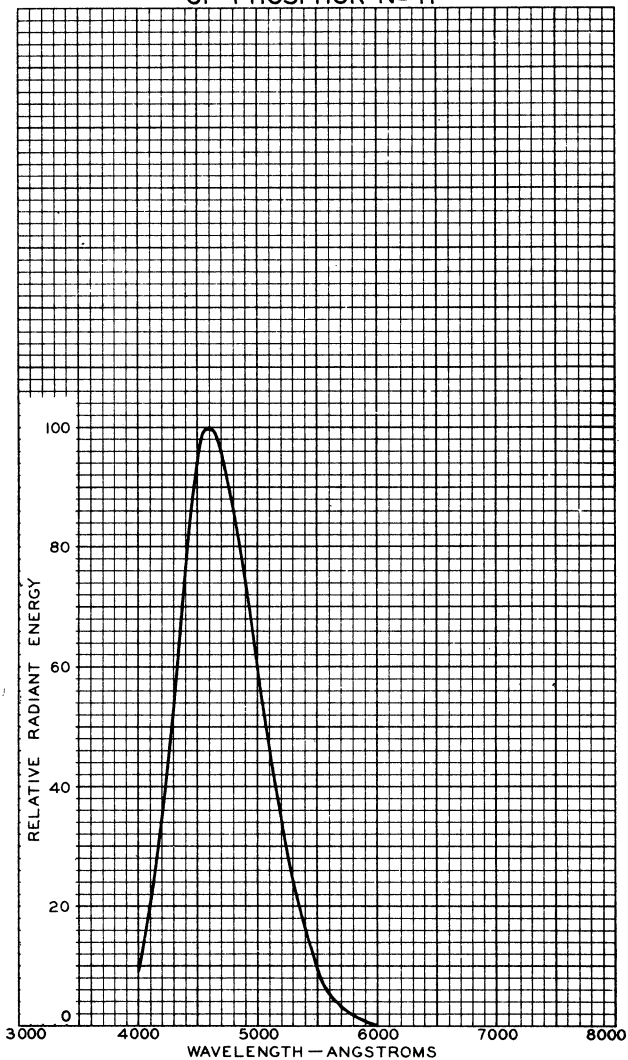
TUBE DIVISION

92CL-6804R5

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR № 11



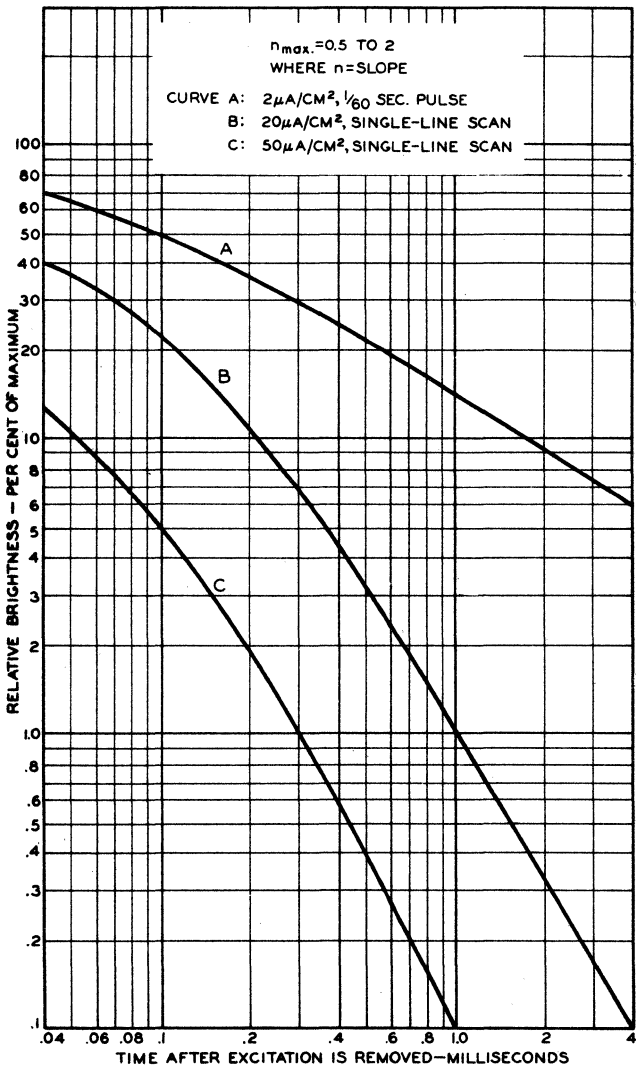
APRIL 9, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6749



PERSISTENCE CHARACTERISTICS OF PHOSPHOR No 11



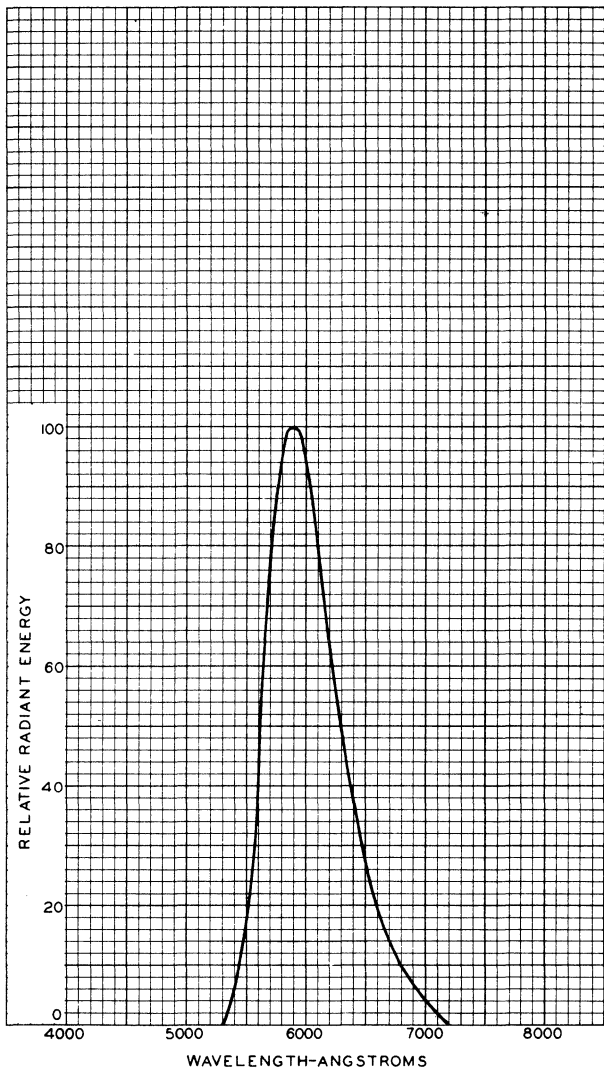
JULY 7, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6806R2



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P12



JULY 18, 1949

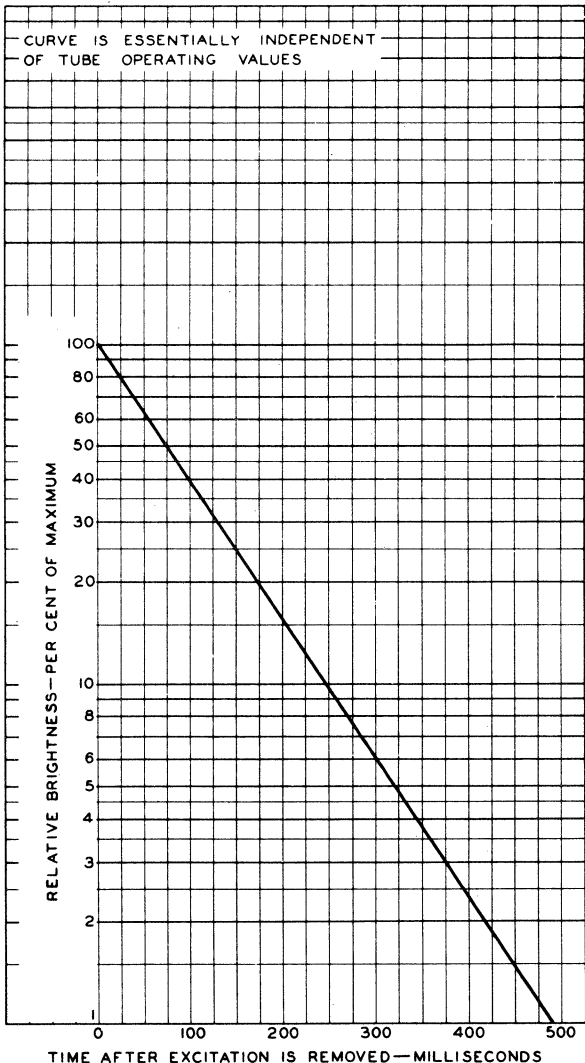
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7317



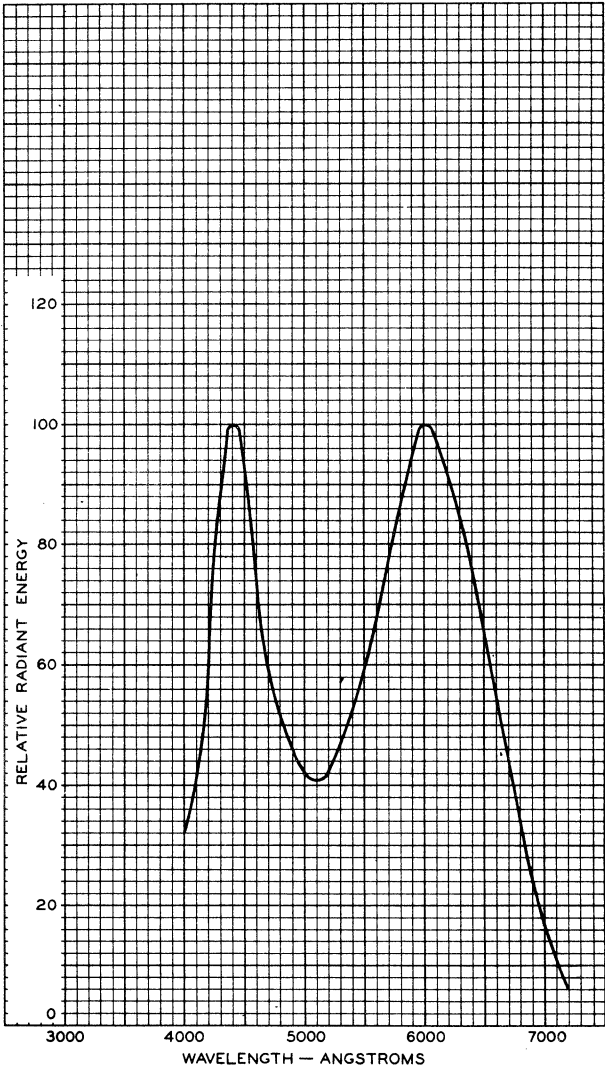
PERSISTENCE CHARACTERISTIC OF PHOSPHOR P12

CURVE IS ESSENTIALLY INDEPENDENT
OF TUBE OPERATING VALUES





SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P14



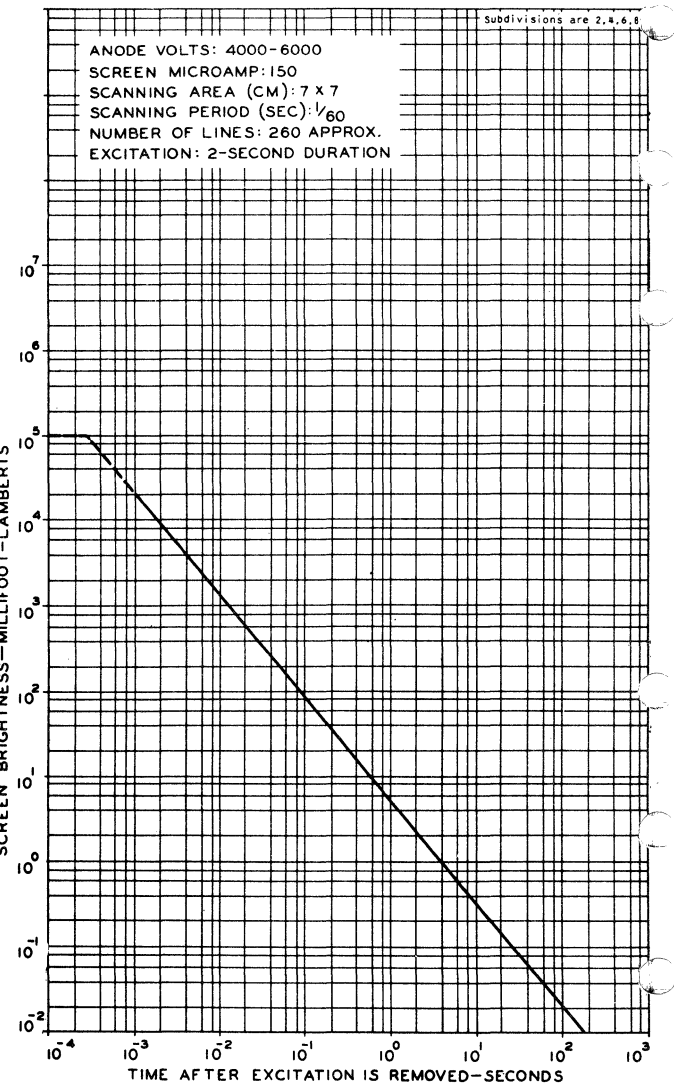
AUG. 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7675



PERSISTENCE CHARACTERISTIC OF PHOSPHOR P14



JAN. 26, 1951

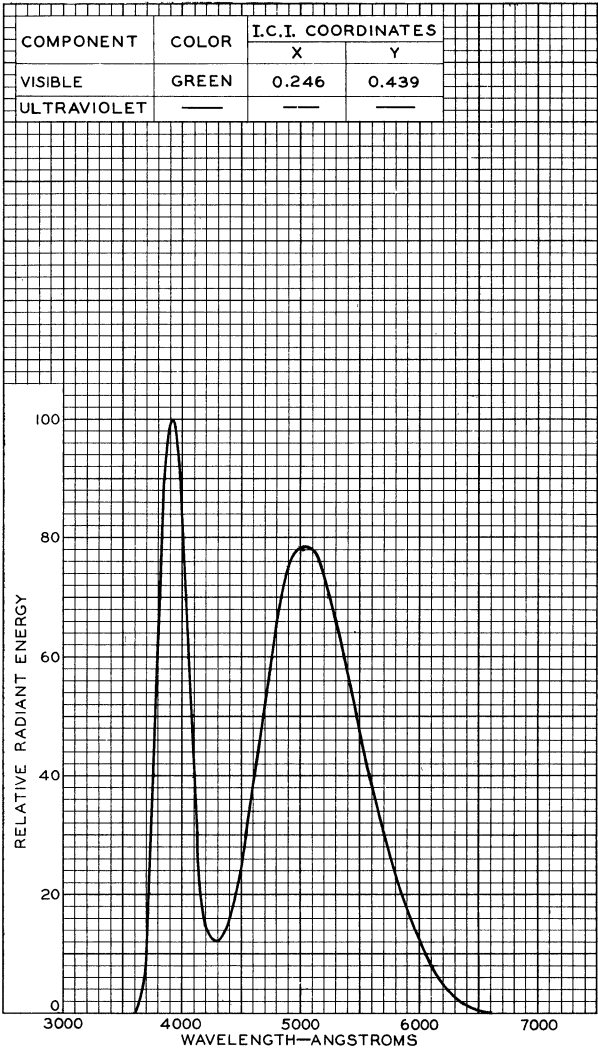
TUBE DEPARTMENT

92CM-7326RI

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P15

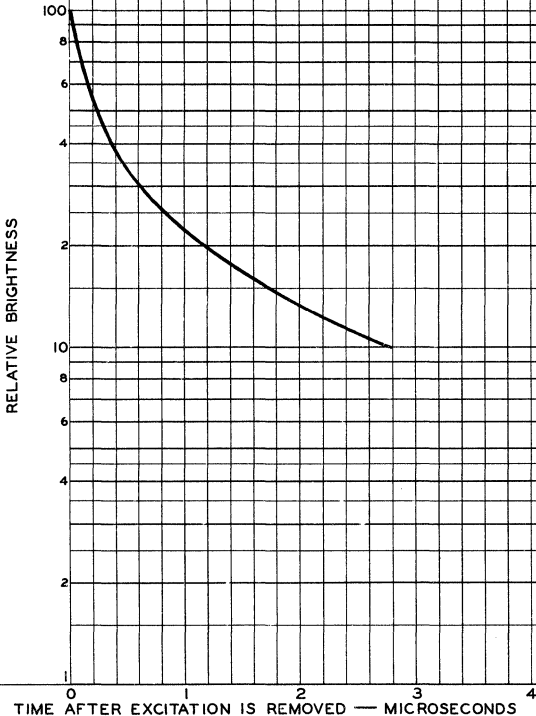




PERSISTENCE CHARACTERISTIC OF PHOSPHOR P15

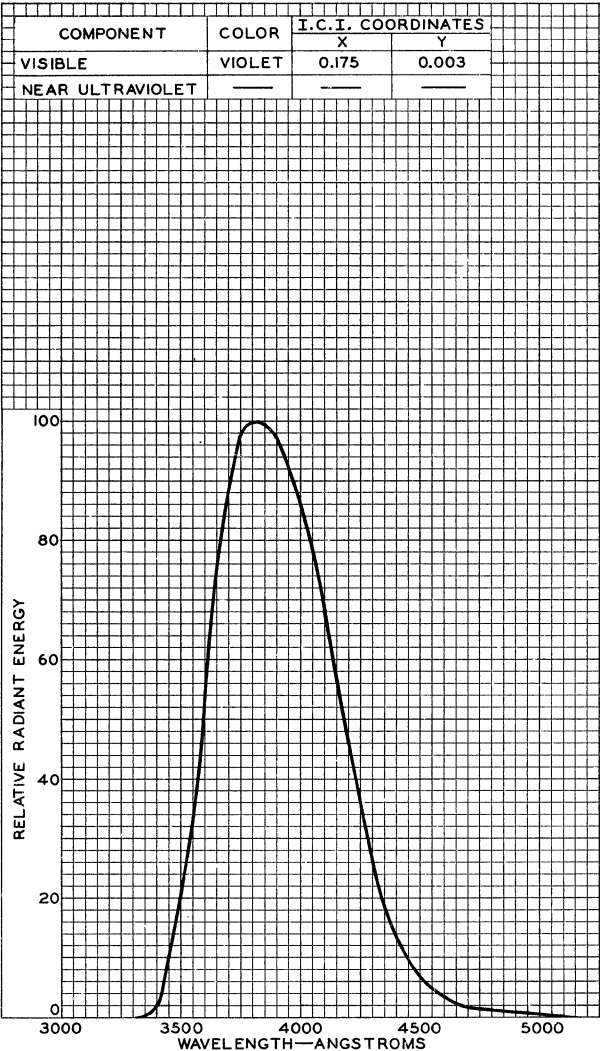
COMPONENTS	EACH ESSENTIALLY INDEPENDENT OF TUBE OPERATING VALUES.
VISIBLE	SHOWN BY CURVE.
ULTRAVIOLET	DECAYS TO APPROXIMATELY 10% OF MAXIMUM IN NOT MORE THAN 0,05 MICROSECOND.

SPOT: SHARPLY FOCUSED.





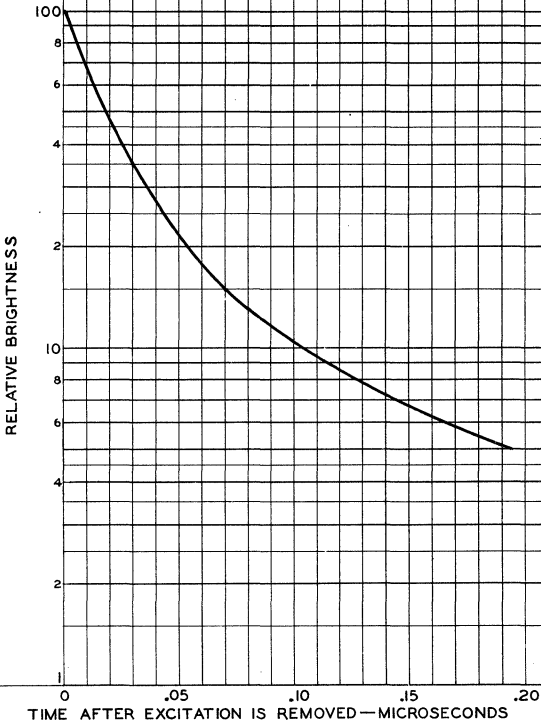
SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P16





PERSISTENCE CHARACTERISTIC OF PHOSPHOR P16

CURVE IS ESSENTIALLY INDEPENDENT OF
TUBE OPERATING VALUES.
SPOT: SHARPLY FOCUSED.



ELECTRON TUBE DIVISION

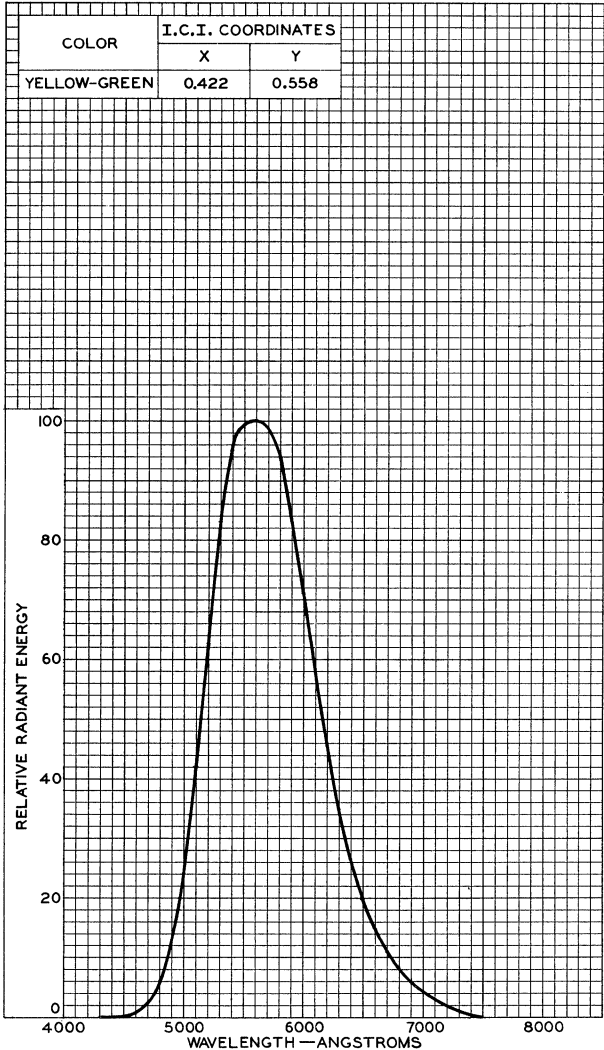
92CM-7564R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P20

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

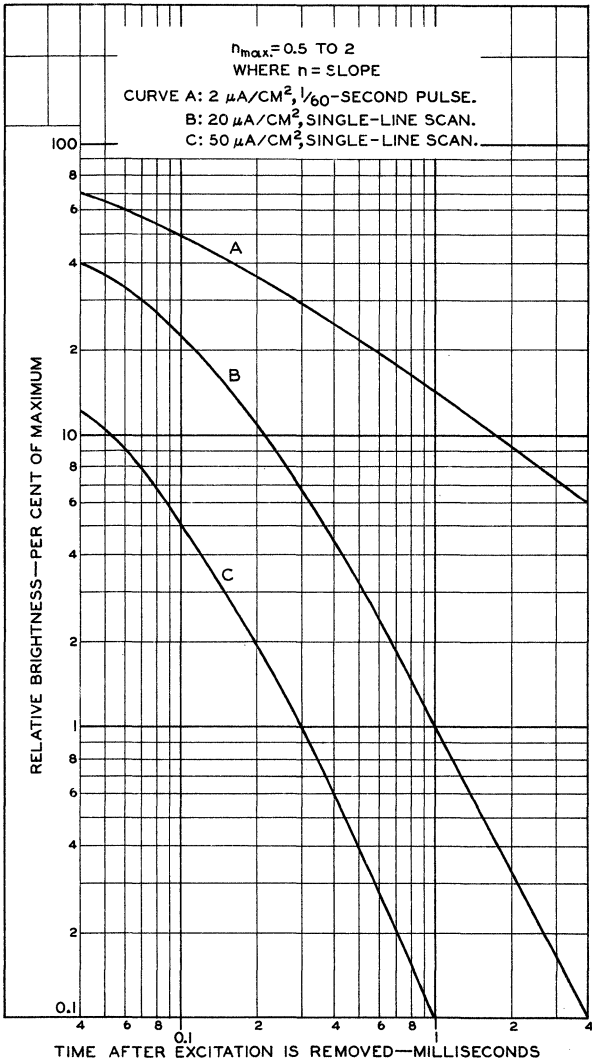




PERSISTENCE CHARACTERISTICS OF PHOSPHOR P20

$n_{max} = 0.5 \text{ TO } 2$
WHERE $n = \text{SLOPE}$

CURVE A: $2 \mu\text{A}/\text{CM}^2$, $1/60$ -SECOND PULSE.
B: $20 \mu\text{A}/\text{CM}^2$, SINGLE-LINE SCAN.
C: $50 \mu\text{A}/\text{CM}^2$, SINGLE-LINE SCAN.



TIME AFTER EXCITATION IS REMOVED—MILLISECONDS

ELECTRON TUBE DIVISION

92CM-6806R2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

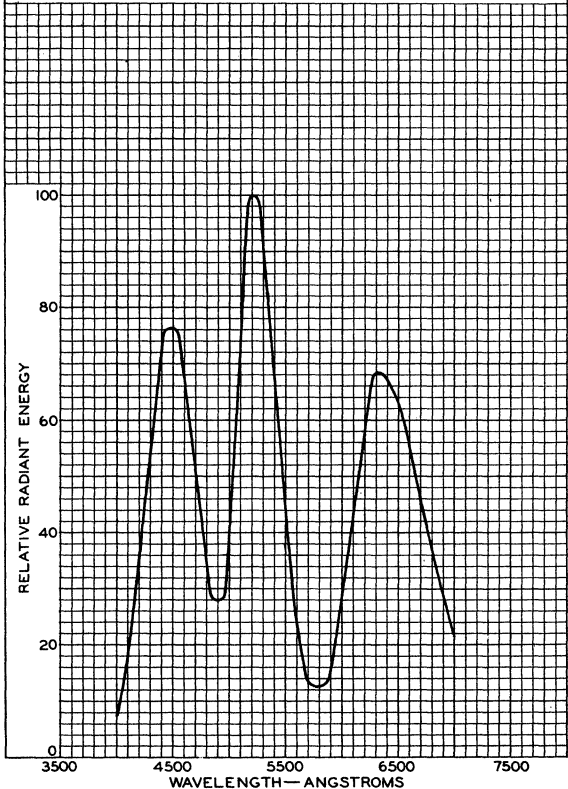
Group Phosphor P22

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



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

GROUP PHOS-
PHOR P22
10-60

Group Phosphor P22

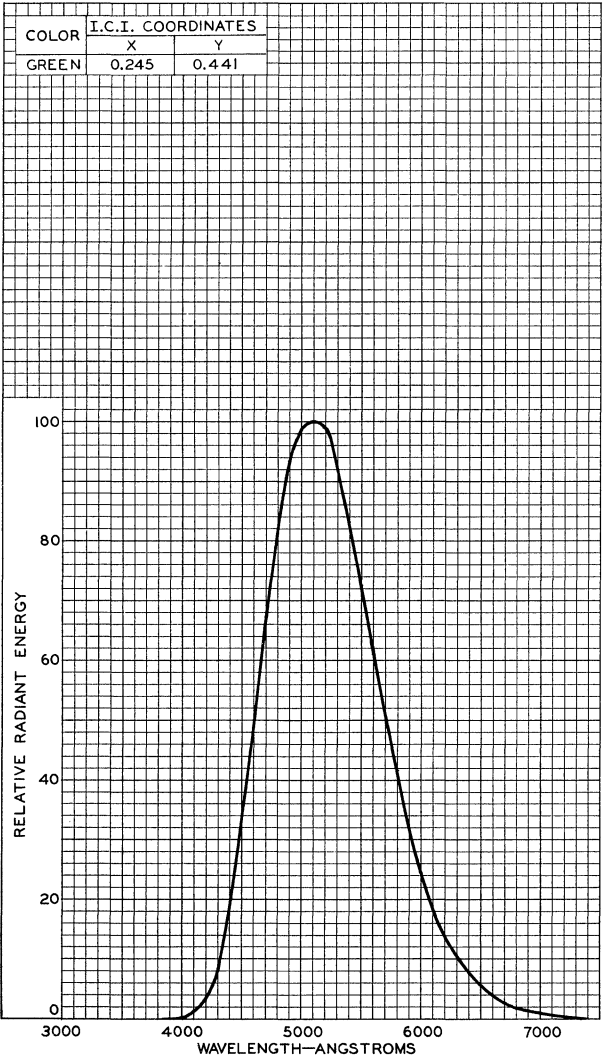
PERSISTENCE CHARACTERISTIC

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





SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P24

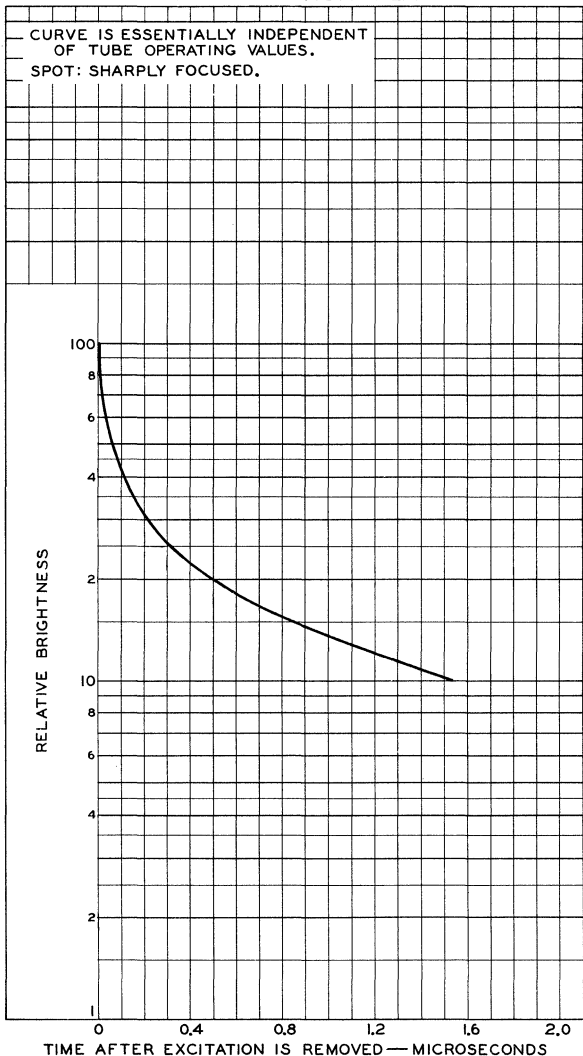




PERSISTENCE CHARACTERISTIC OF PHOSPHOR P24

CURVE IS ESSENTIALLY INDEPENDENT
OF TUBE OPERATING VALUES.

SPOT: SHARPLY FOCUSED.



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 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

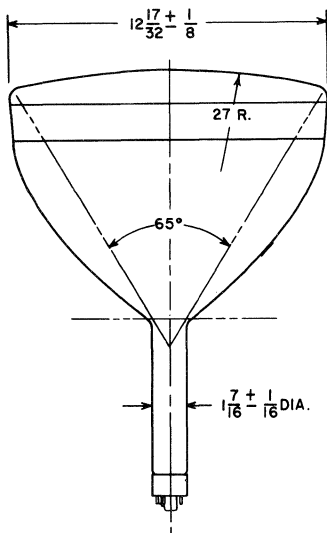
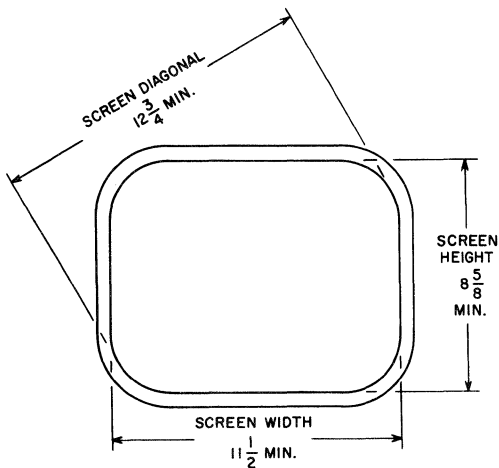
Near Reference Line. Refers to the position of the contact area usually employed for grounding a *Regular* or *Modified Band* of external conductive coating. A spring-finger contact mounted on the deflecting yoke or on the tube mounting assembly is normally employed for grounding the external conductive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



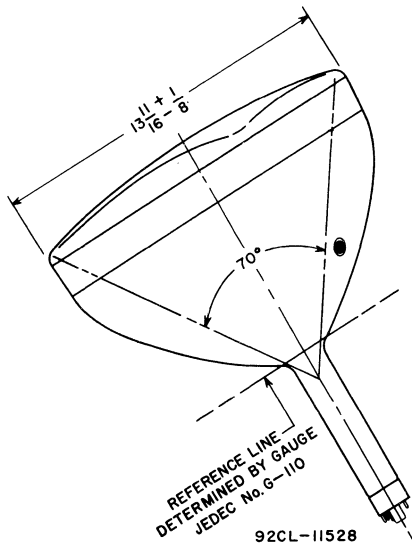
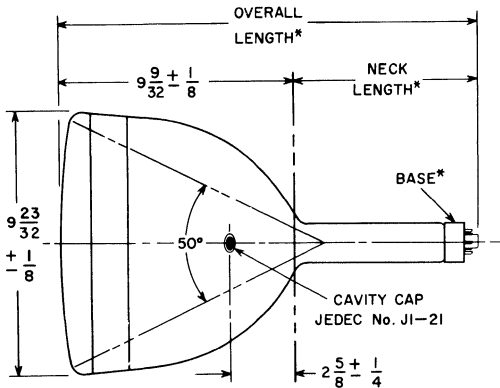
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J109-1/2 A/C

BULB J109-1/2 A/C



ALL DIMENSIONS IN INCHES

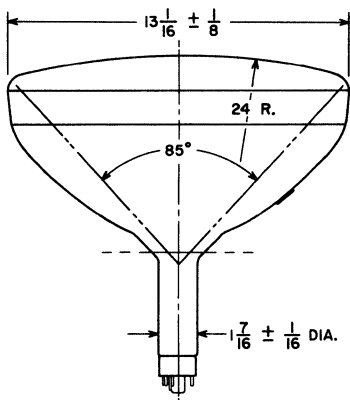
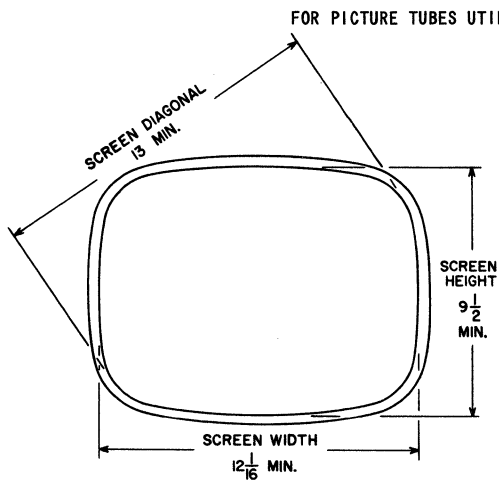
* See data for specific tube type.



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

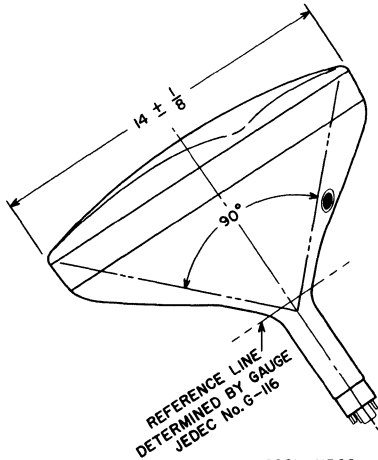
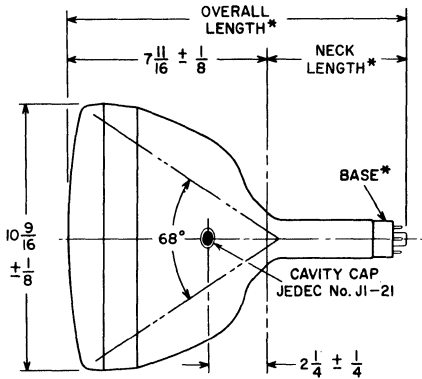
CRT
OUTLINES 2
3-62

Dimensional Outline



Bulb J112 A/B

BULB J112 A/B



92CL-11506

ALL DIMENSIONS IN INCHES

* See data for specific tube type.

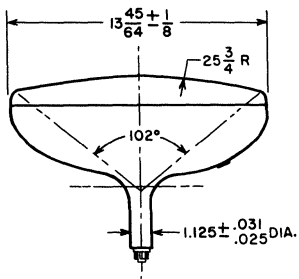
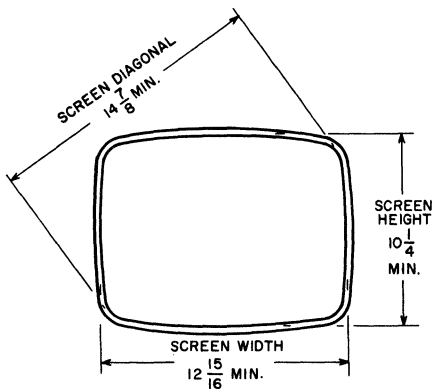


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 3
6-63

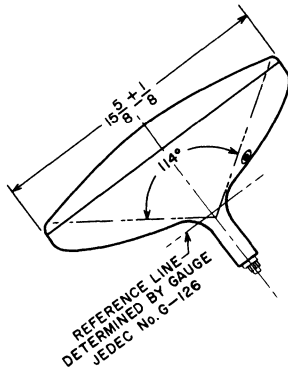
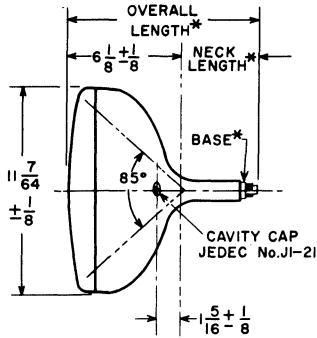
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J125 C2

BULB J125 C2



92CL-12037

ALL DIMENSIONS IN INCHES

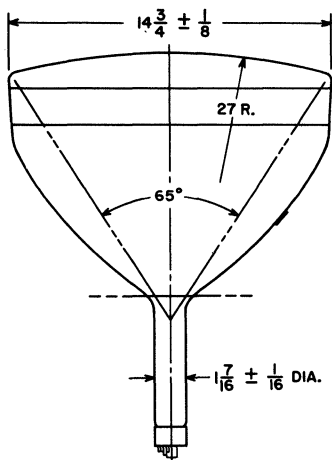
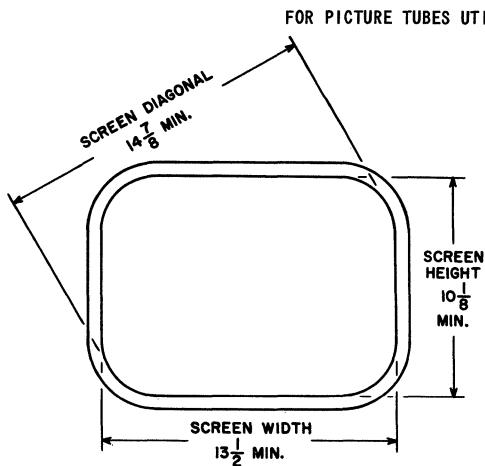
* See data for specific tube type.



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

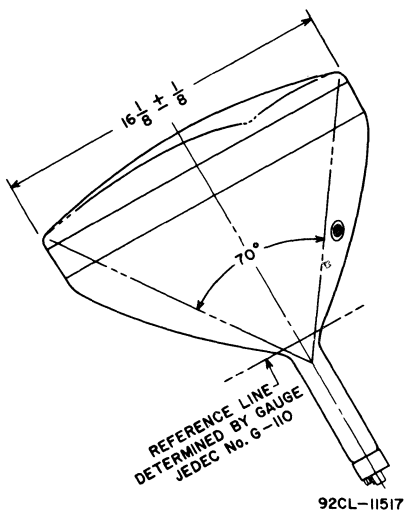
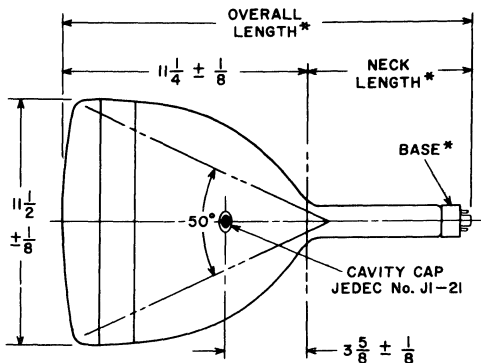
CRT
OUTLINES 3A
6-63

Dimensional Outline



Bulb J129 A/B

BULB J129 A/B



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

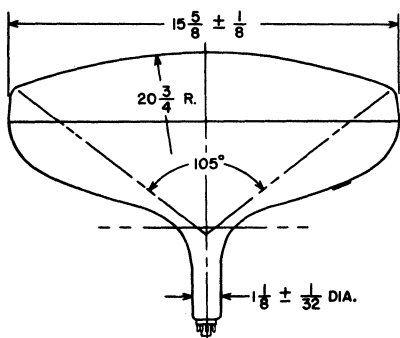
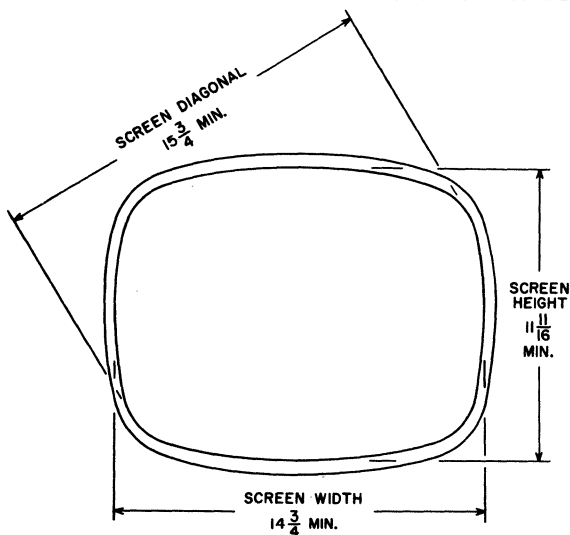


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 4
3-62

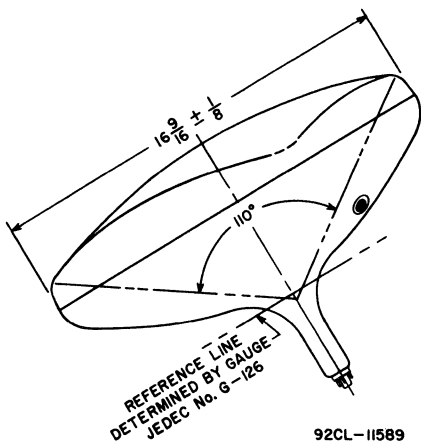
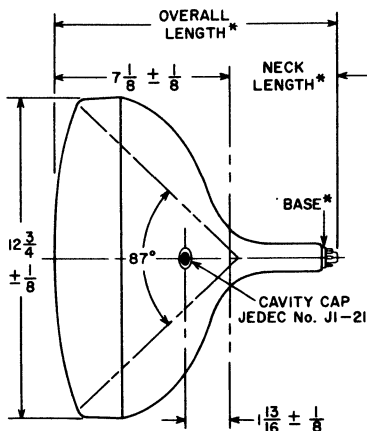
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J132-1/2 A/B

BULB J132-1/2 A/B



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

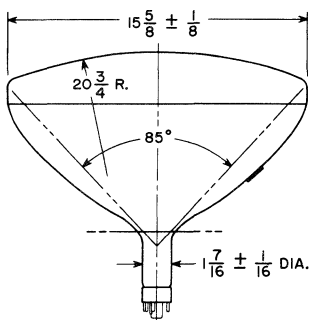
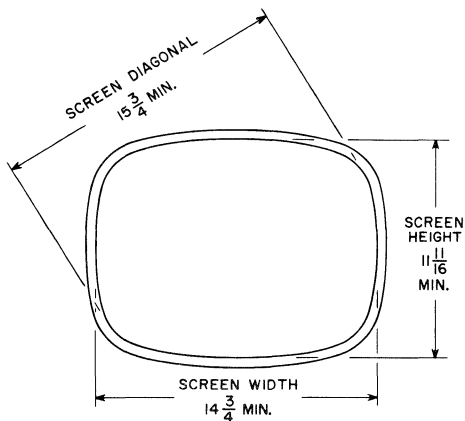


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 5
3-62

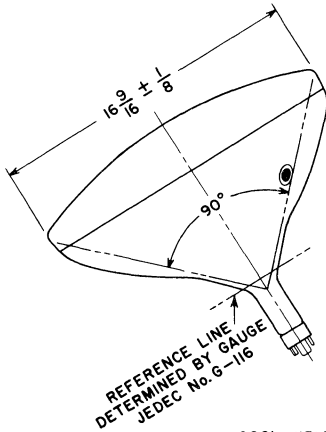
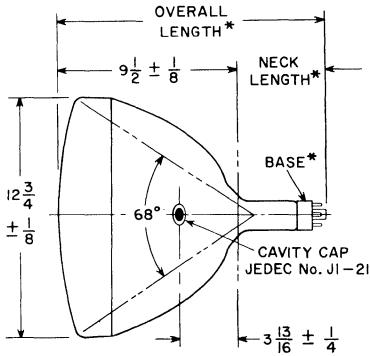
Dimensional Outline

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.

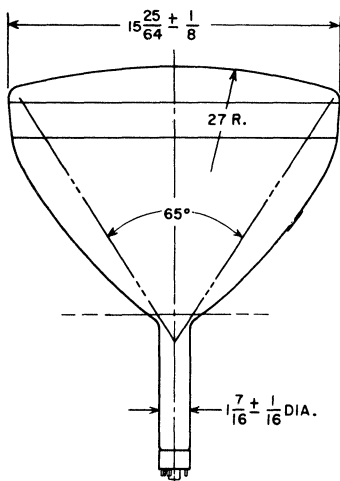
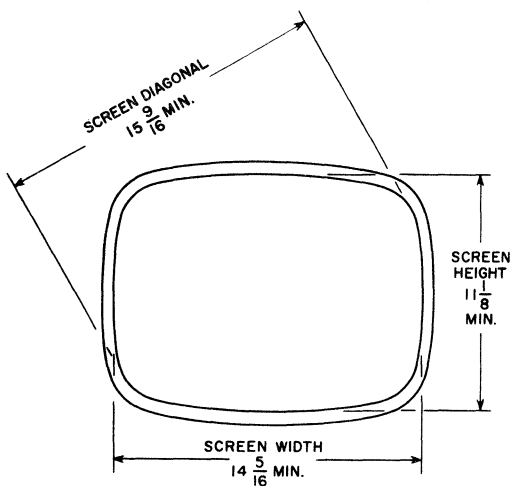


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 6
3-62

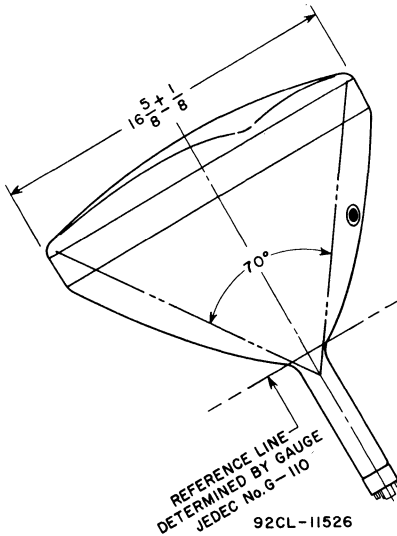
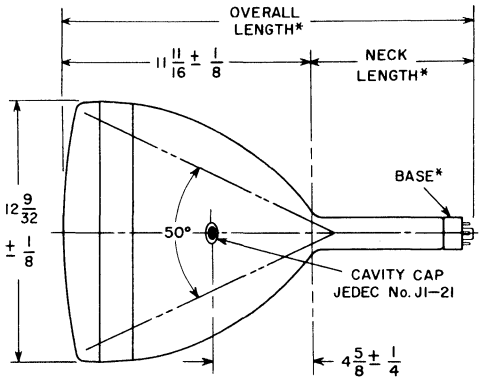
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J133 B/D

BULB J133 B/D



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

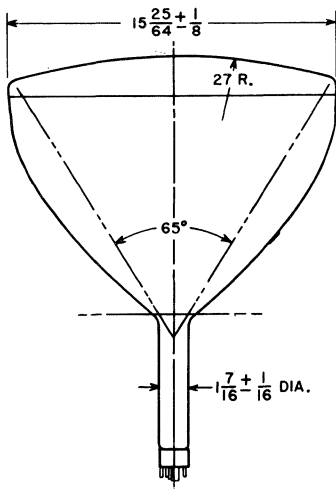
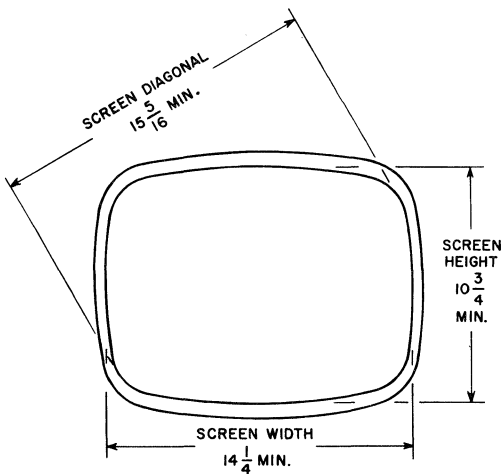


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 7
3-62

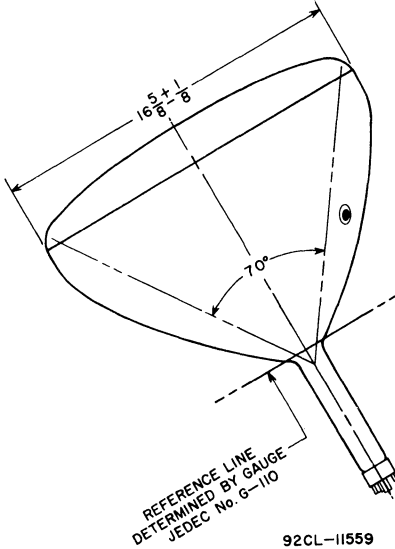
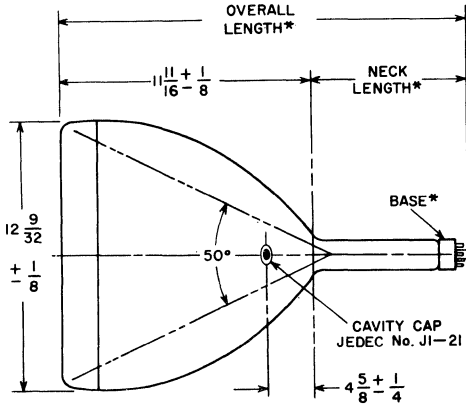
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J133 C/E

BULB J133 C/E



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

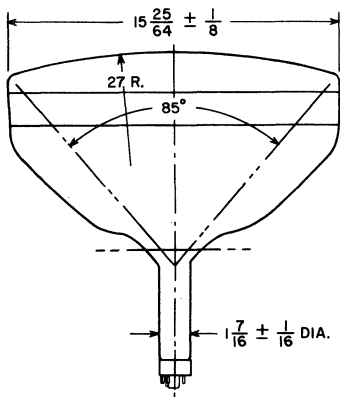
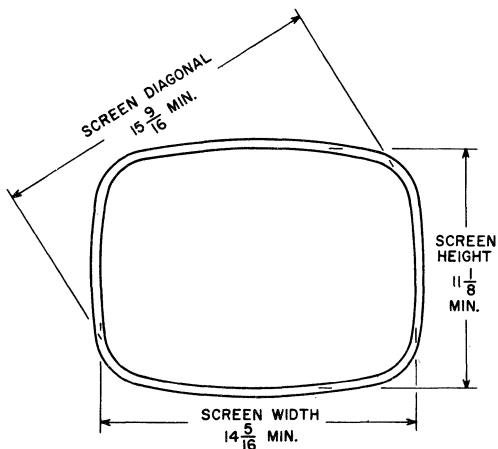


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 8
3-62

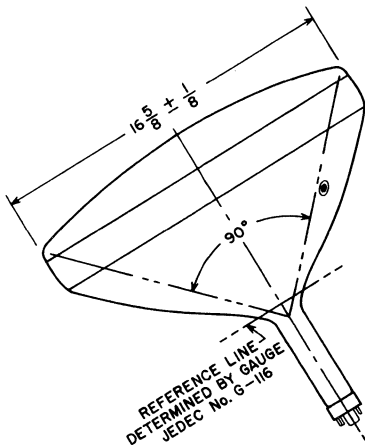
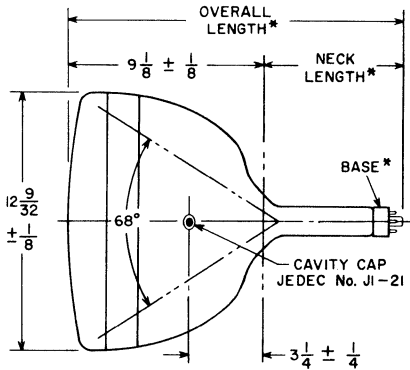
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J133 F/G

BULB J133 F/G



92CL-11557

ALL DIMENSIONS IN INCHES

* See data for specific tube type.

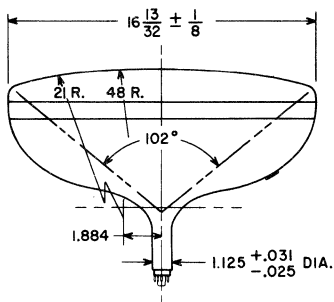
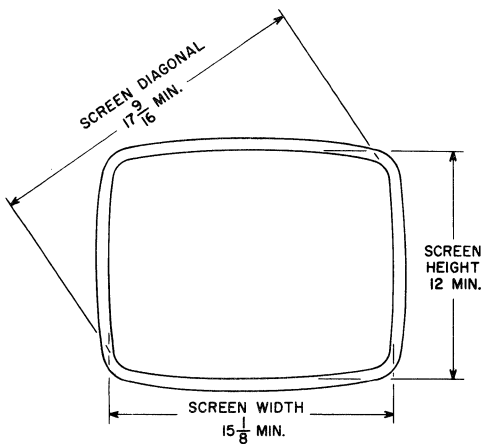


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 9
3-62

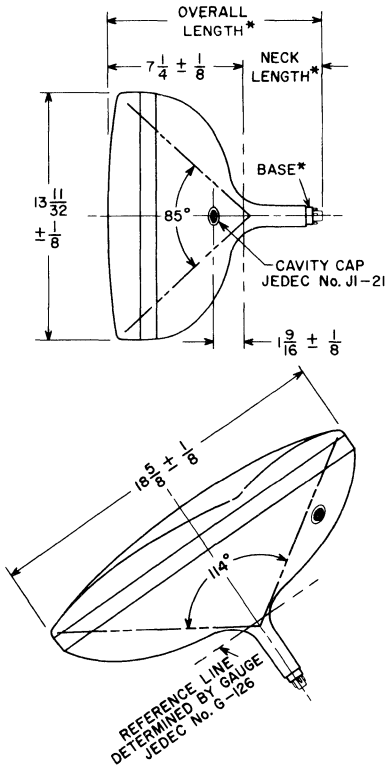
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J149 A

BULB J149 A



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

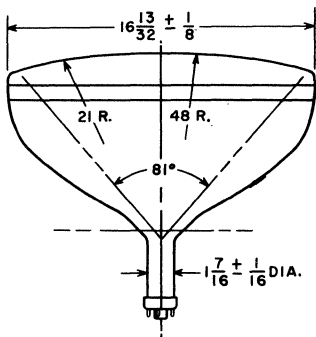
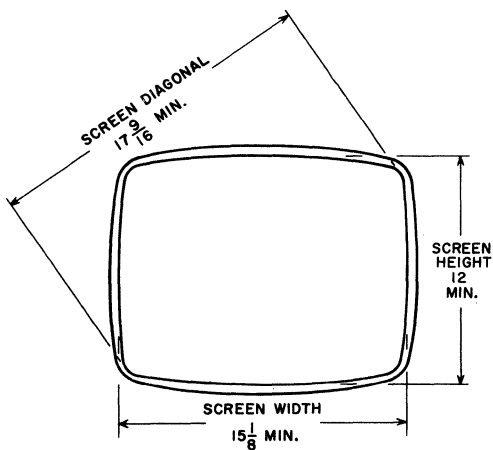


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

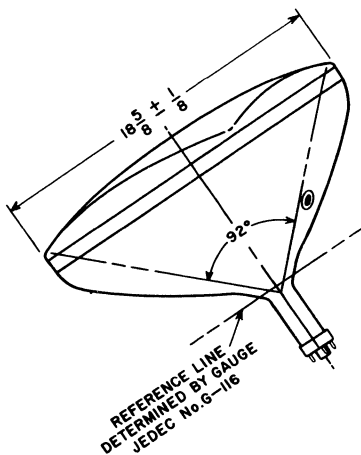
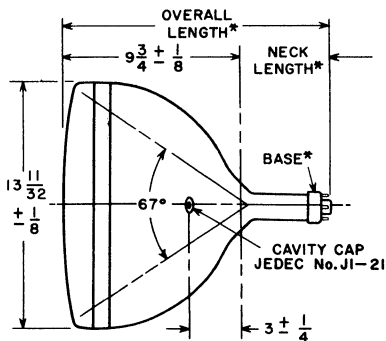
CRT
OUTLINES 10
3-62

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J149 B



92CL-11604

ALL DIMENSIONS IN INCHES

* See data for specific tube type.

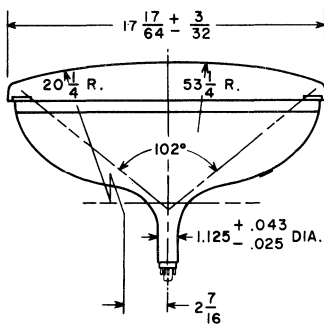
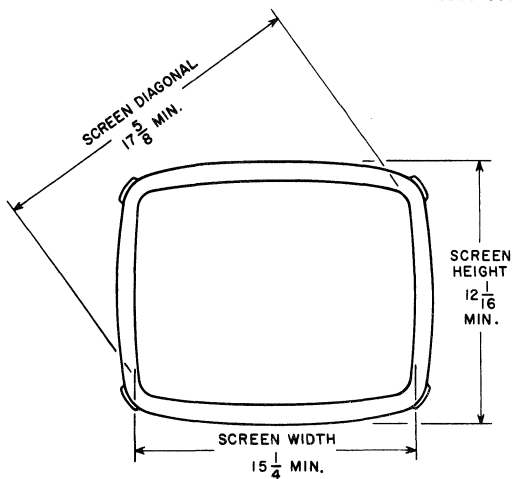


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

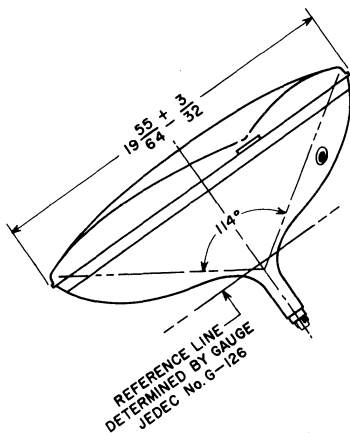
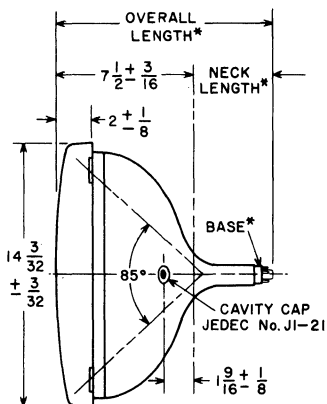
CRT
OUTLINES 11
3-62

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J149 C AND PROTECTIVE PANEL



92CL-11570

ALL DIMENSIONS IN INCHES

* See data for specific tube type.

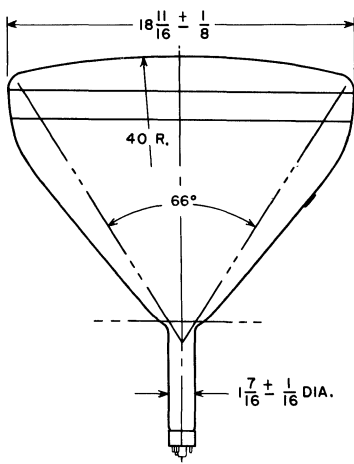
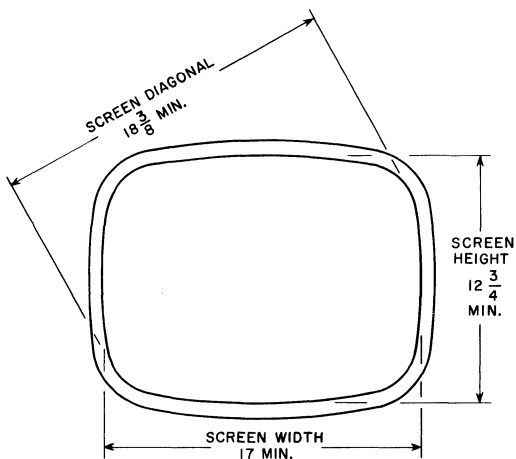


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 12
3-62

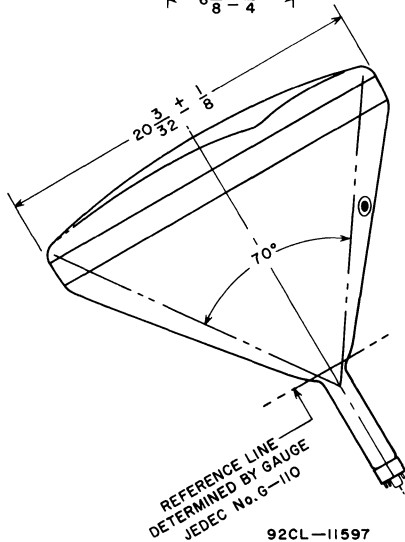
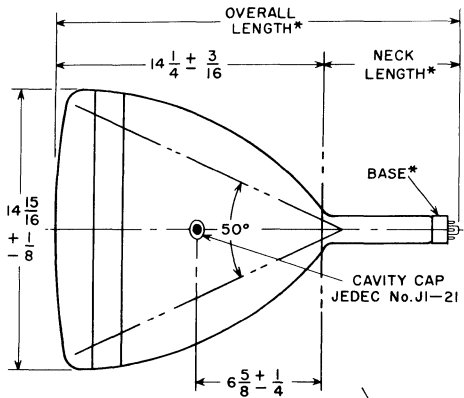
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J161 C/D

BULB J161 C/D



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

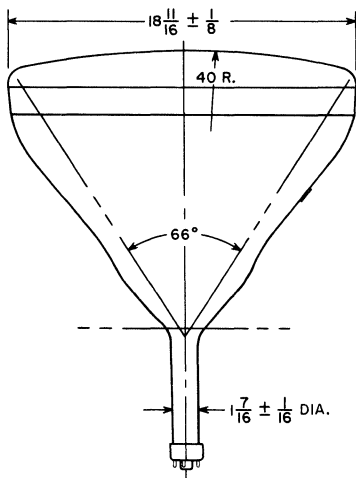
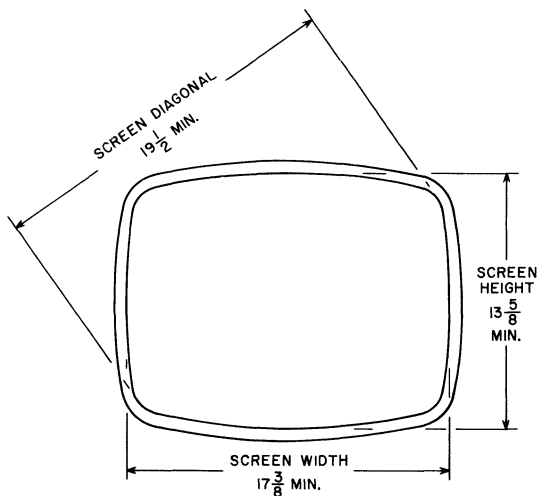


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 13
3-62

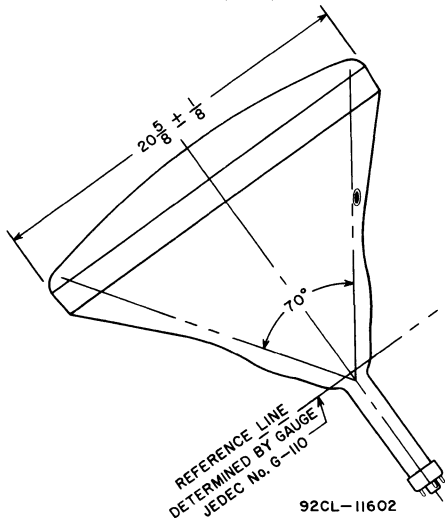
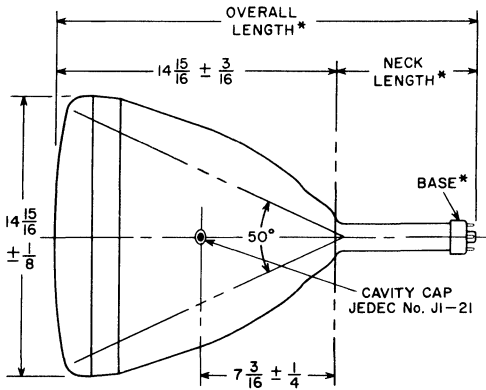
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J165 Z

BULB J165 Z



ALL DIMENSIONS IN INCHES

*See data for specific tube type.

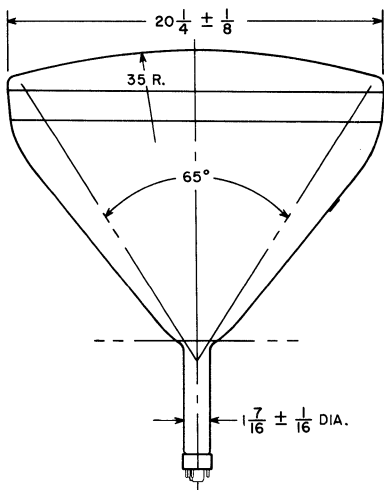
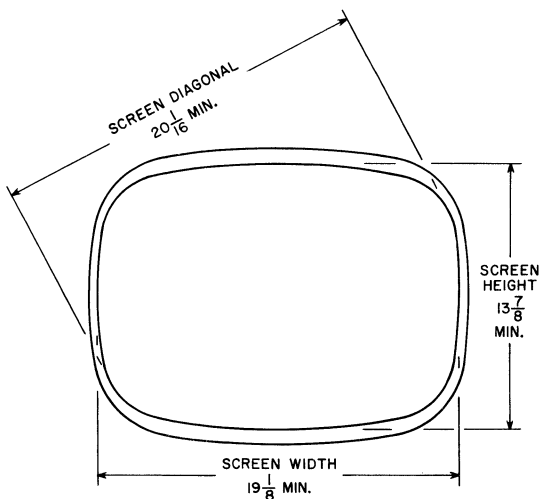


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 14
3-62

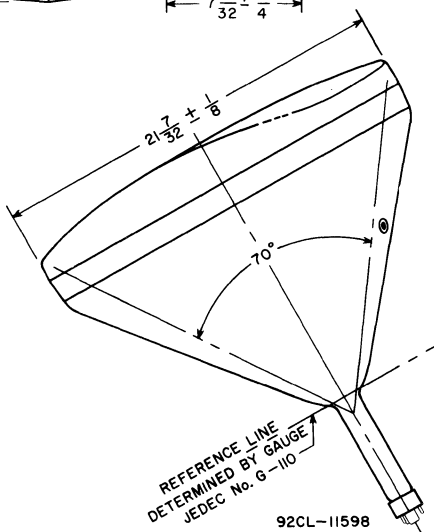
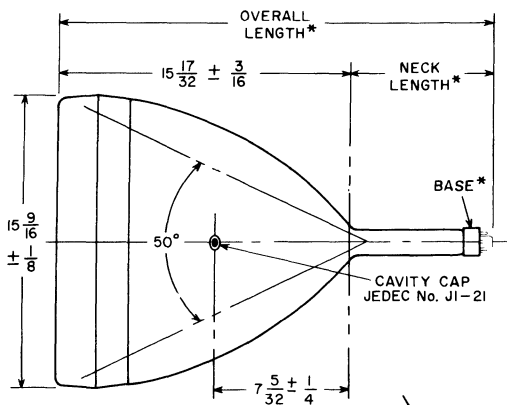
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J170 A/C

BULB J170 A/C



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

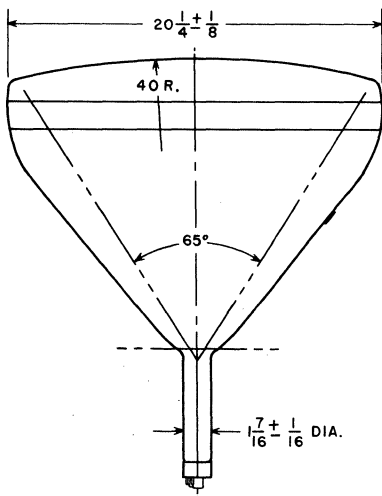
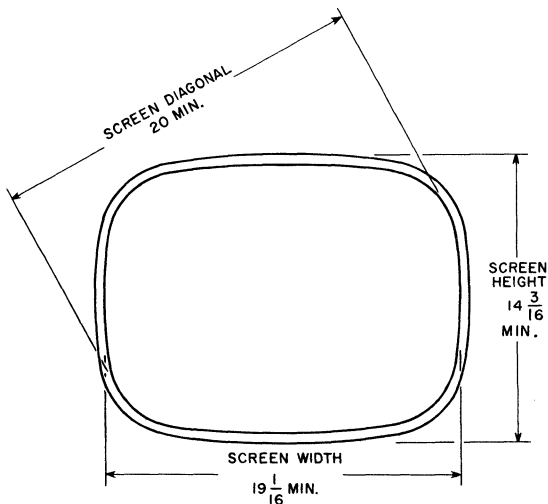


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 15
3-62

Dimensional Outline

FOR PICTURE TUBES UTILIZING



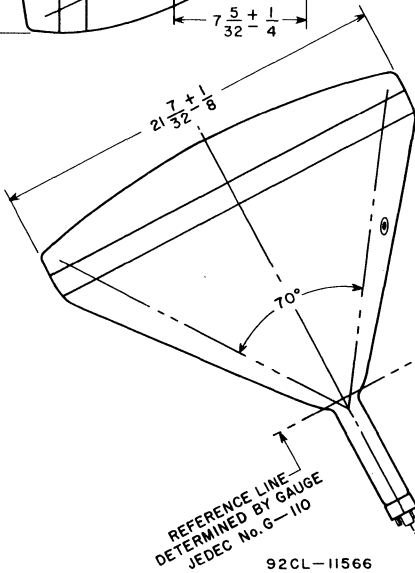
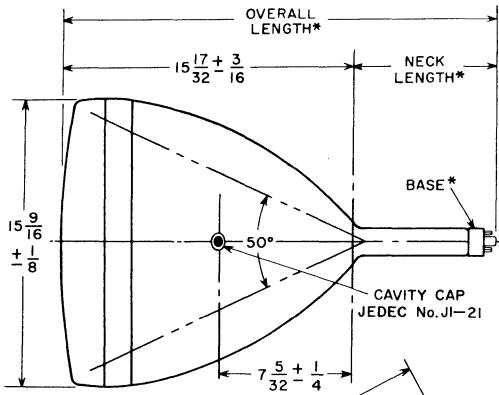
RADIO CORPORATION OF AMERICA
Electron Tube Division

Harrison, N. J.



Bulb J170 B/D

BULB J170 B/D



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

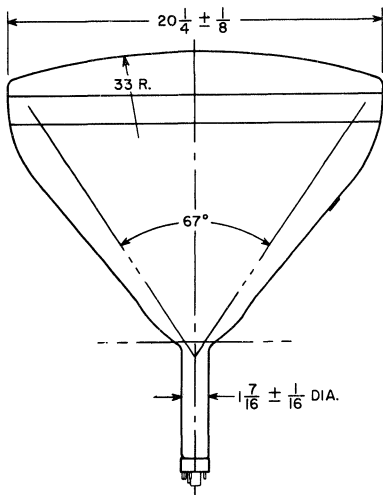
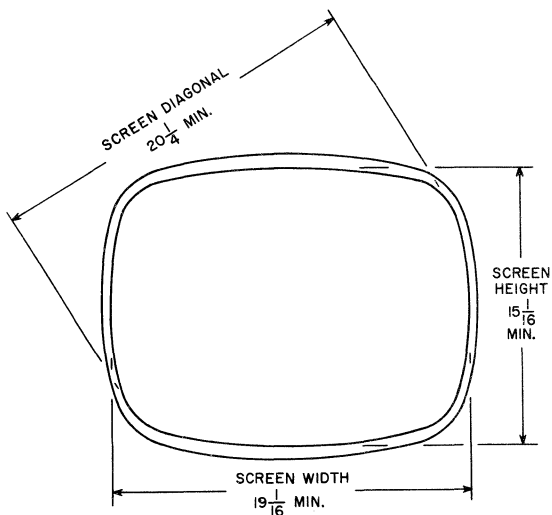


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 16
3-62

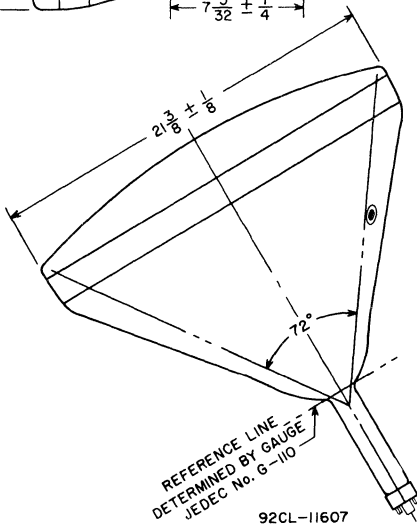
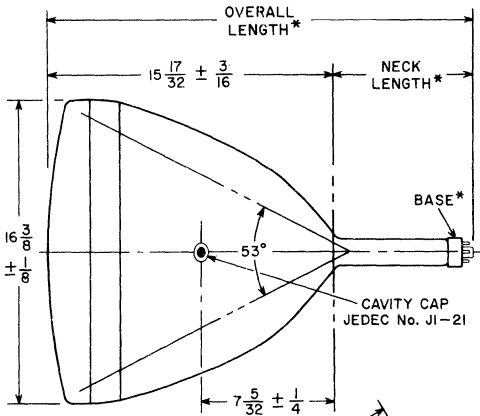
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J171 B/F

BULB J171 B/F



ALL DIMENSIONS IN INCHES

*See data for specific tube type.

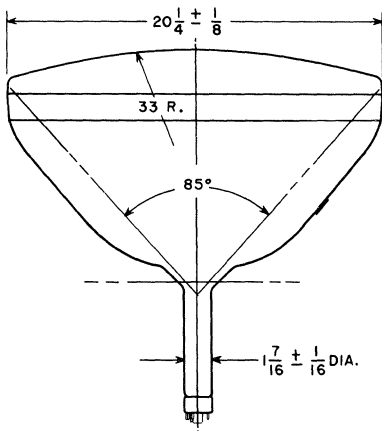
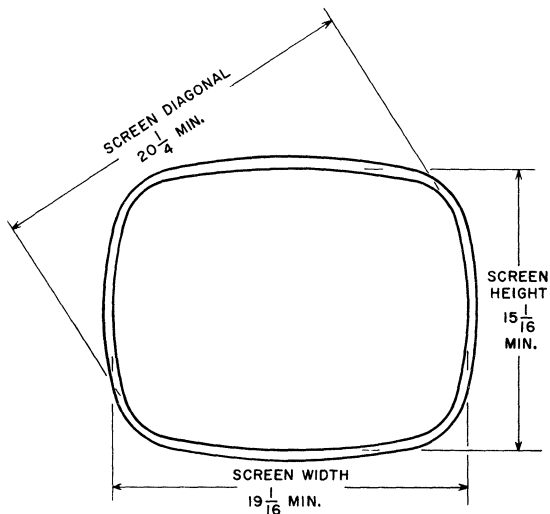


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 17
3-62

Dimensional Outline

FOR PICTURE TUBES UTILIZING



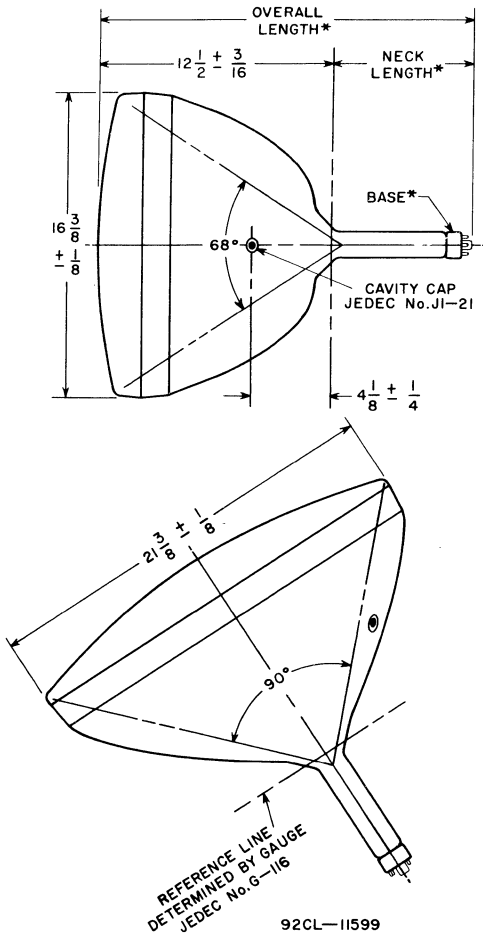
RADIO CORPORATION OF AMERICA
Electron Tube Division

Harrison, N. J.



Bulb J171 D/E

BULB J171 D/E



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

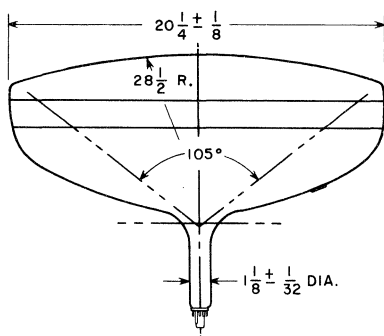
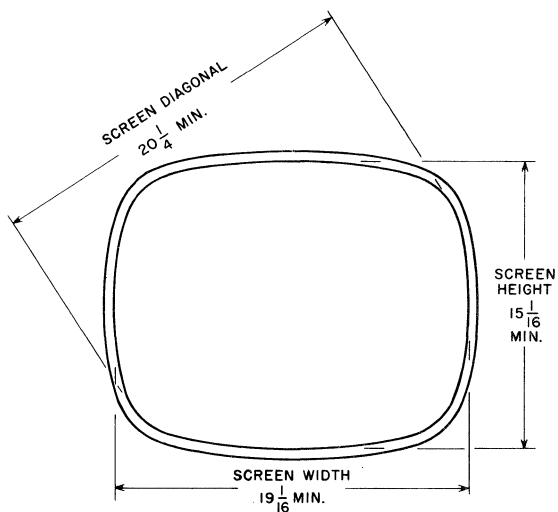


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 18
3-62

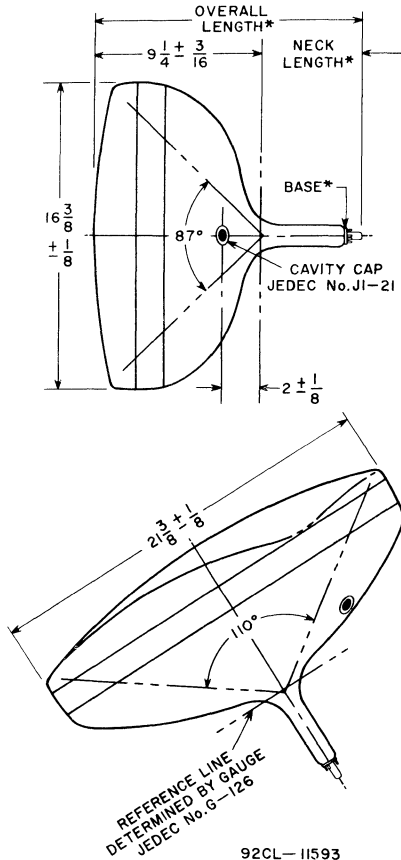
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J171 G/K

BULB J171 G/K



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

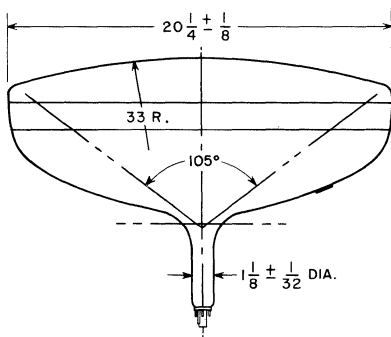
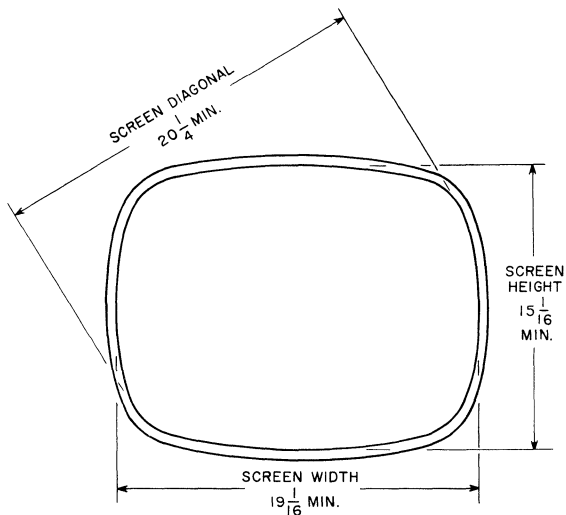


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

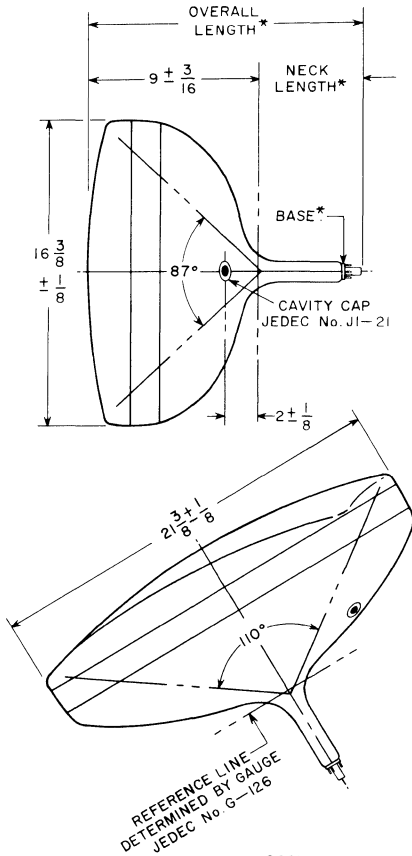
CRT
OUTLINES 19
3-62

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J171 H/J



ALL DIMENSIONS IN INCHES

*See data for specific tube type.

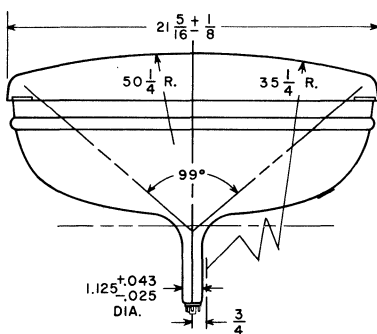
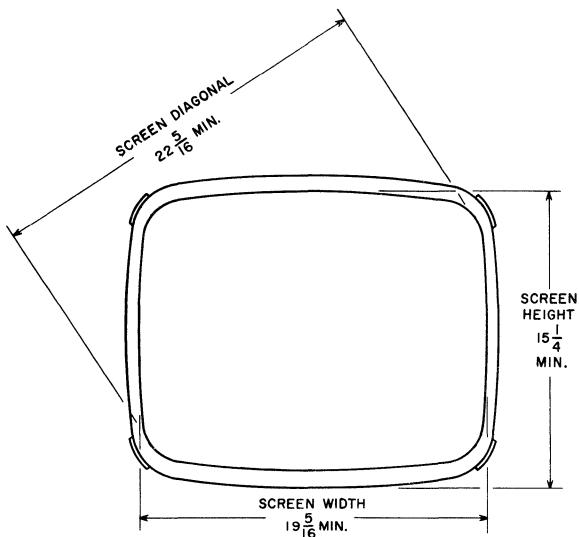


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 20
3-62

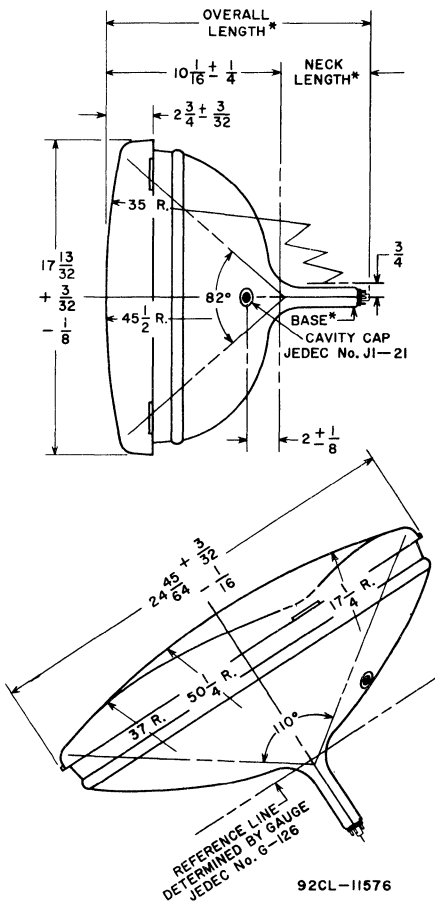
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J187 A

BULB J187 A AND PROTECTIVE PANEL



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

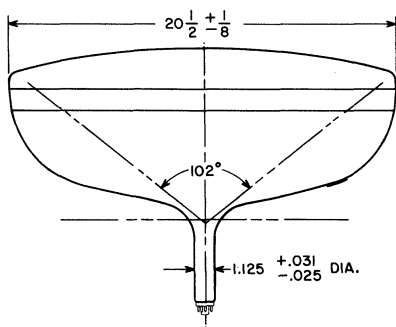
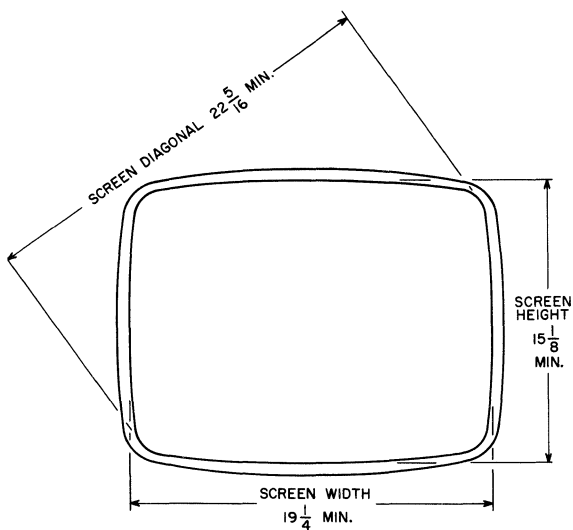


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

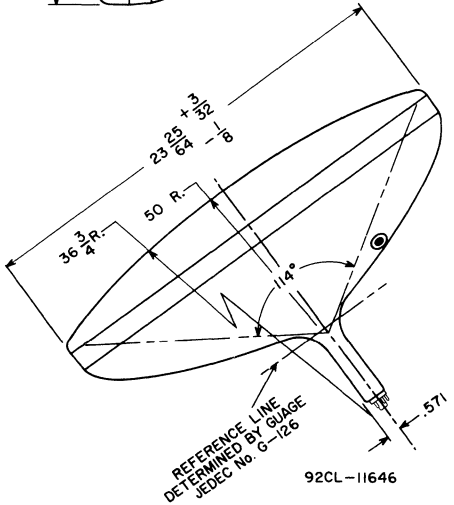
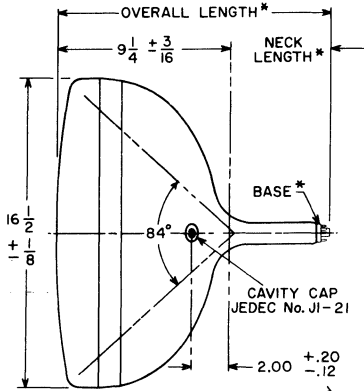
CRT
OUTLINES 21
3-62

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J187 B



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

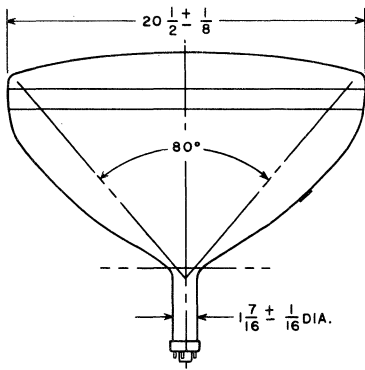
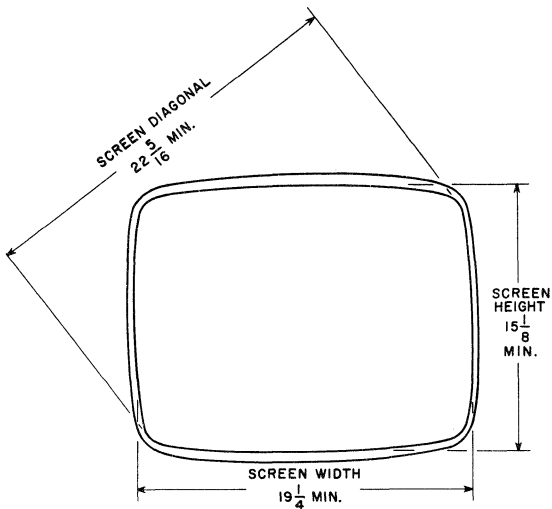


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 22
3-62

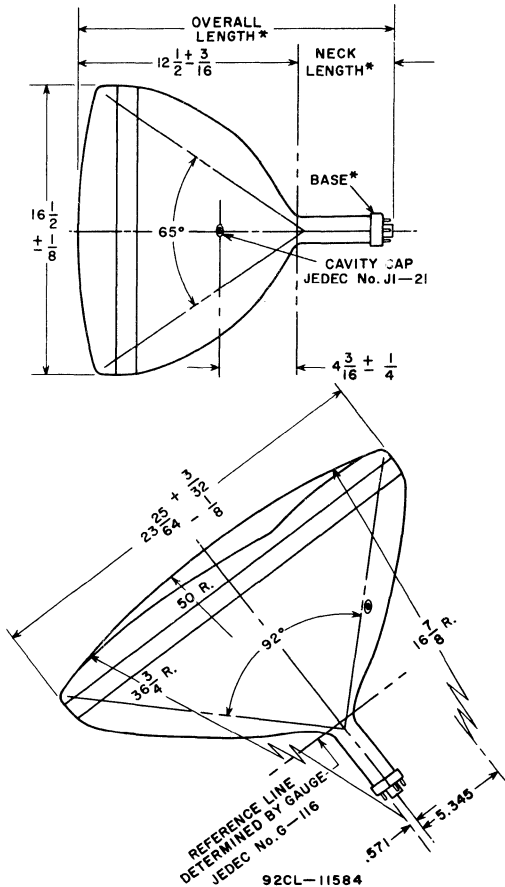
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J187 C/F

BULB J187 C/F



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

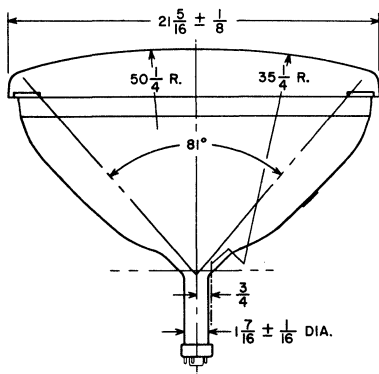
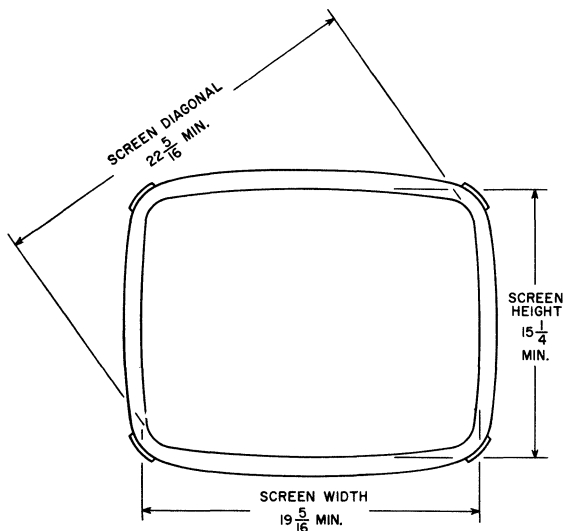


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 23
3-62

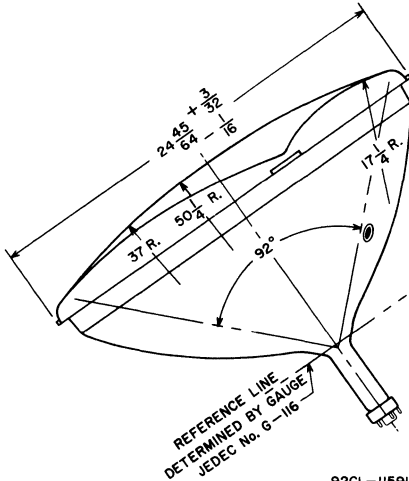
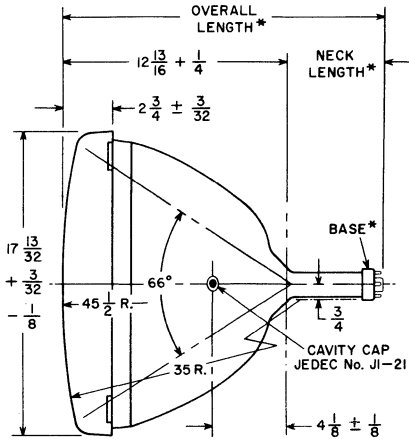
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J187 D/G

BULB J187 D/G AND PROTECTIVE PANEL



92CL-11591

ALL DIMENSIONS IN INCHES

* See data for specific tube type.

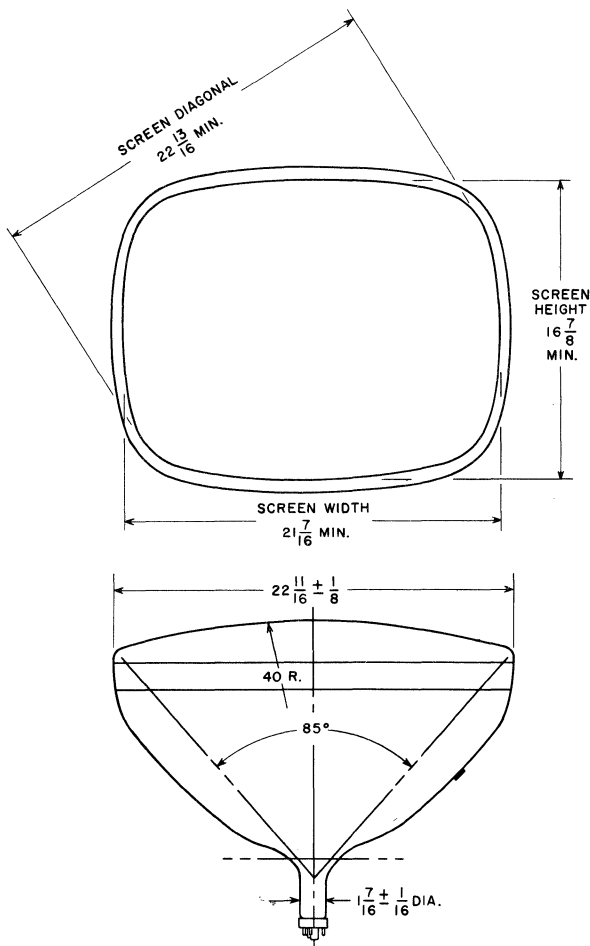


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 24
3-62

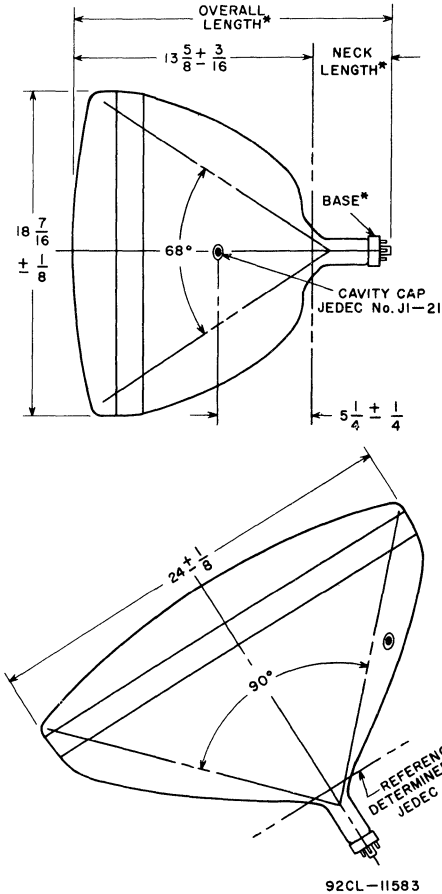
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J192 A/B

BULB J192 A/B



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

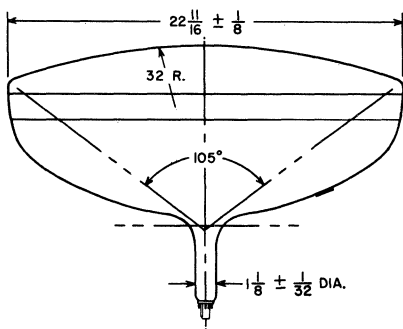
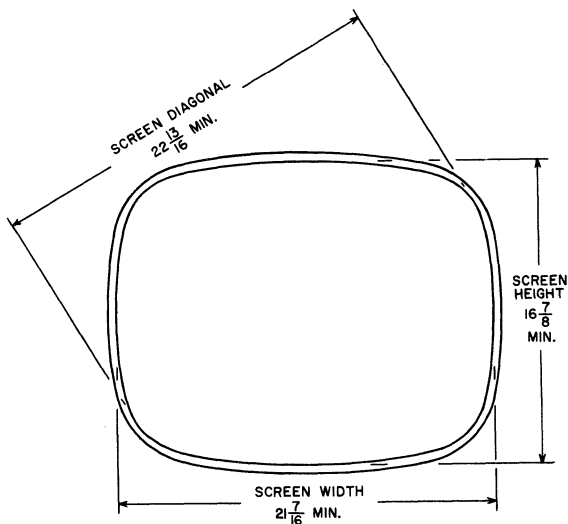


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 25
3-62

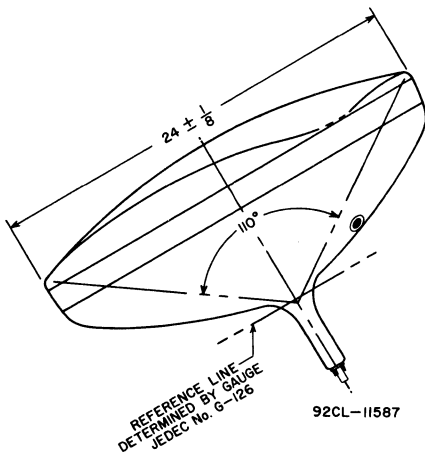
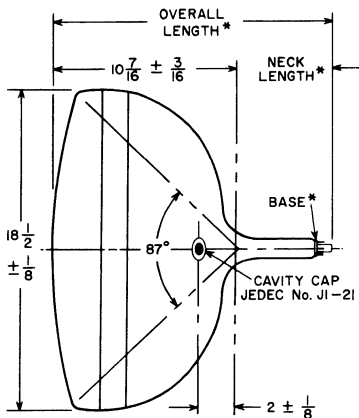
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb J192 C/D

BULB J192 C/D



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

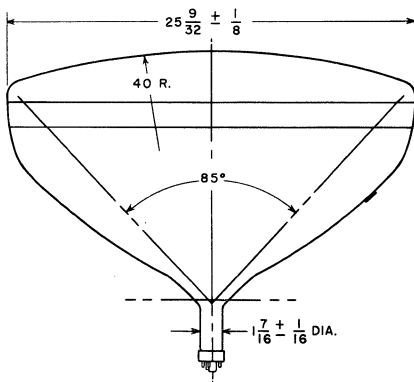
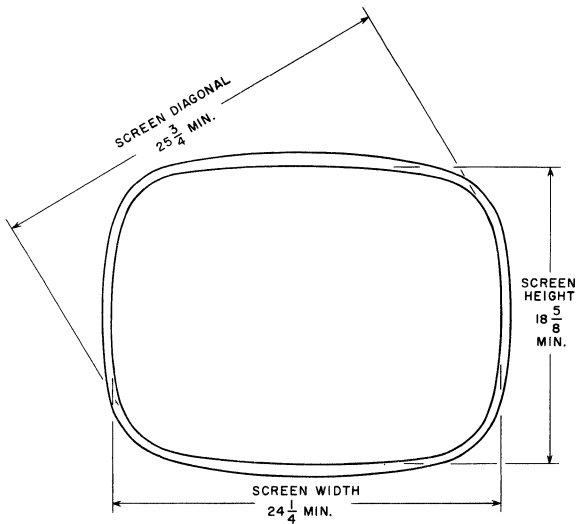


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 26
3-62

Dimensional Outline

FOR PICTURE TUBES UTILIZING



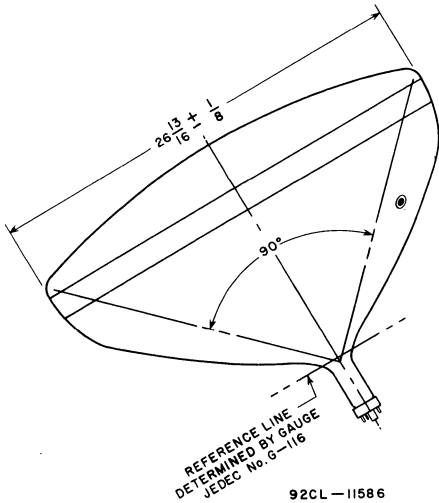
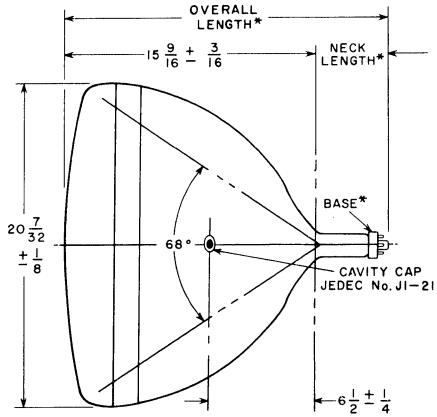
RADIO CORPORATION OF AMERICA
Electron Tube Division

Harrison, N. J.



Bulb J214-1/2 A

BULB J214-1/2 A



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

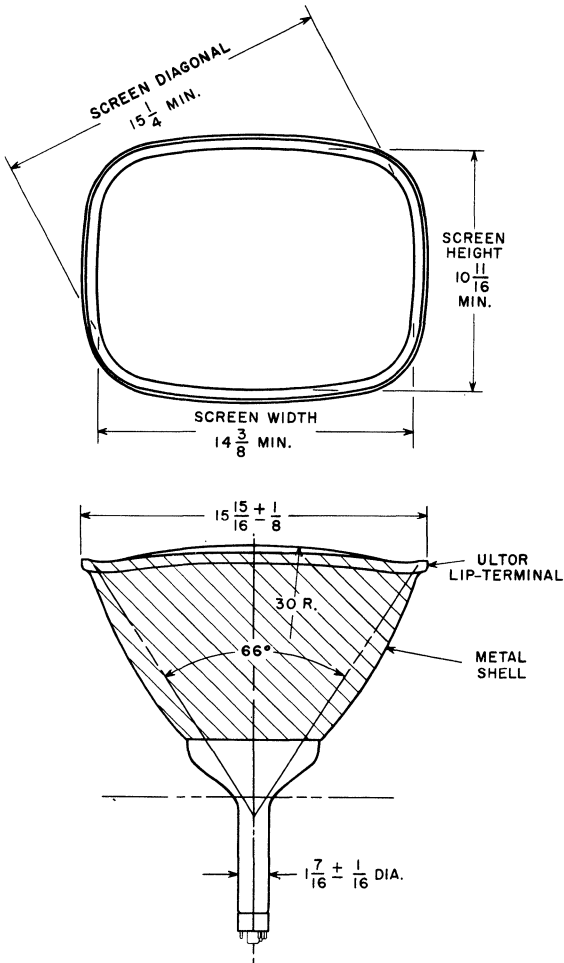


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 27
3-62

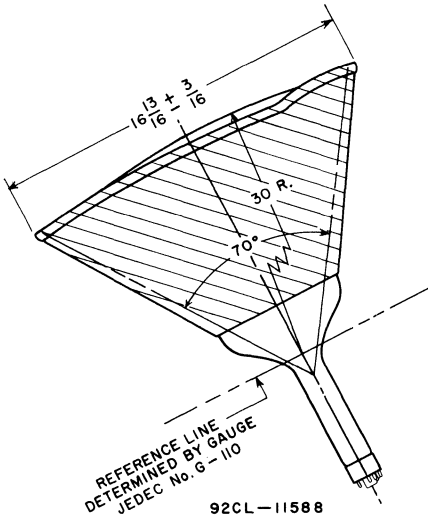
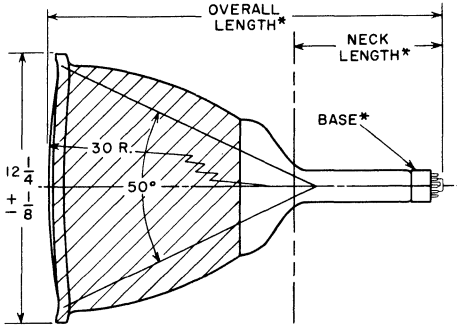
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb MJ135 A

BULB MJ135 A



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

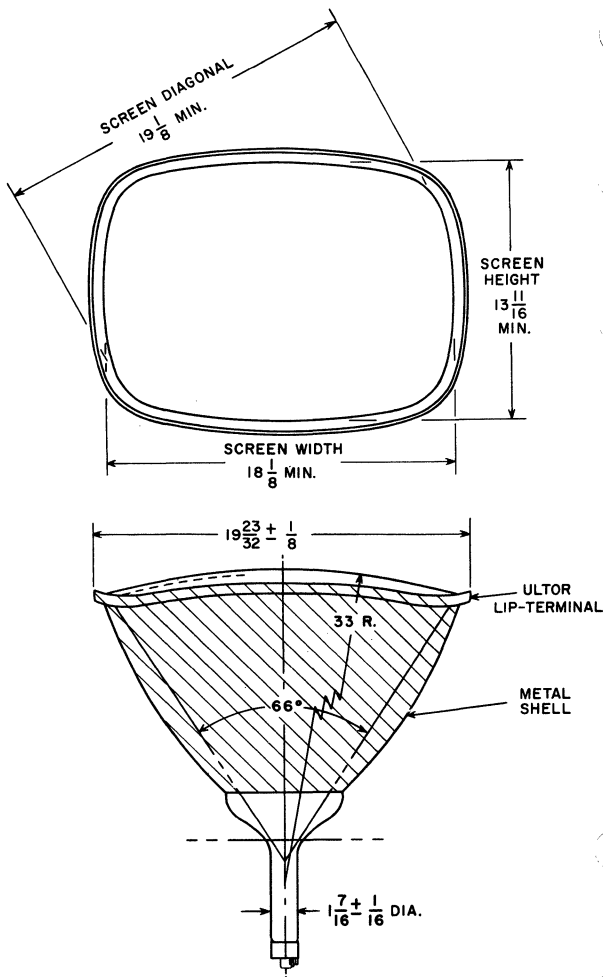


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 28
3-62

Dimensional Outline

FOR PICTURE TUBES UTILIZING



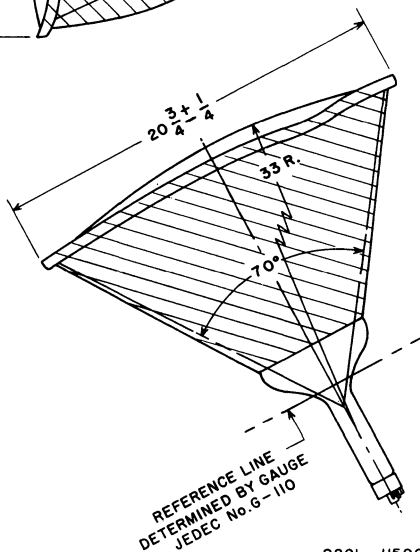
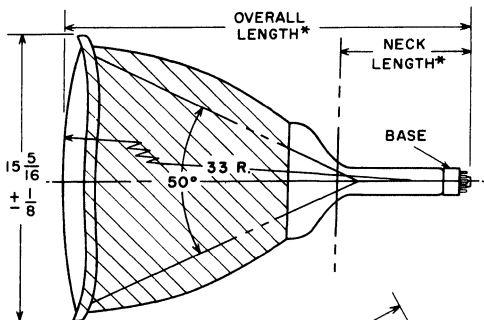
RADIO CORPORATION OF AMERICA
Electron Tube Division

Harrison, N. J.



Bulb MJ166 A

BULB MJ166 A



92CL-11590

ALL DIMENSIONS IN INCHES

* See data for specific tube type.

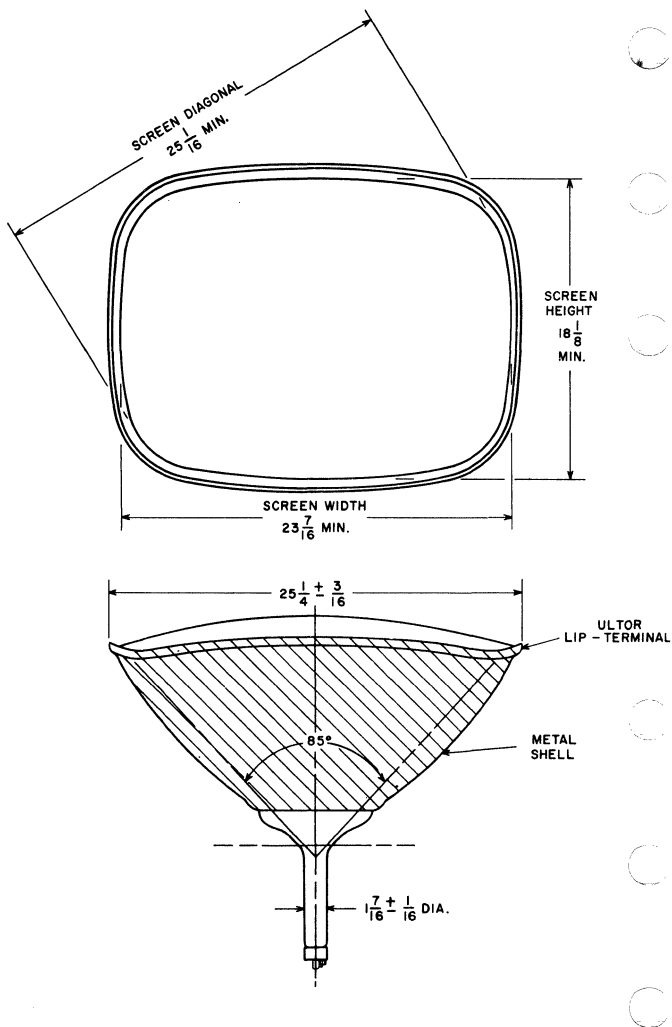


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 29
3-62

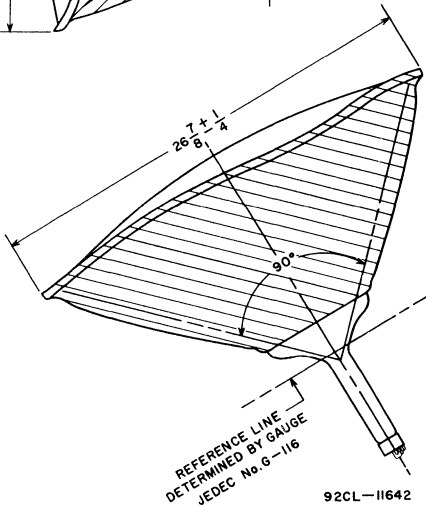
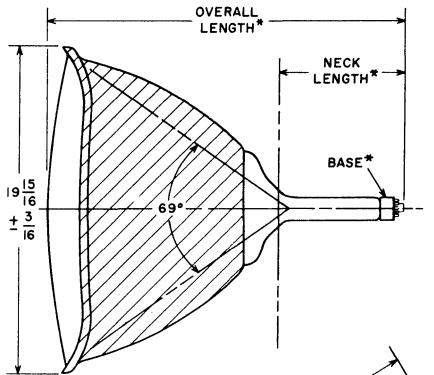
Dimensional Outline

FOR PICTURE TUBES UTILIZING



Bulb MJ214 A

BULB MJ214 A



ALL DIMENSIONS IN INCHES

* See data for specific tube type.



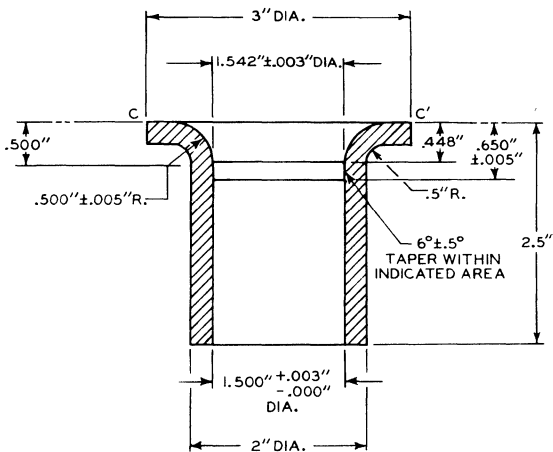
RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

CRT
OUTLINES 30
3-62





REFERENCE-LINE GAUGE JETEC N^o G-110

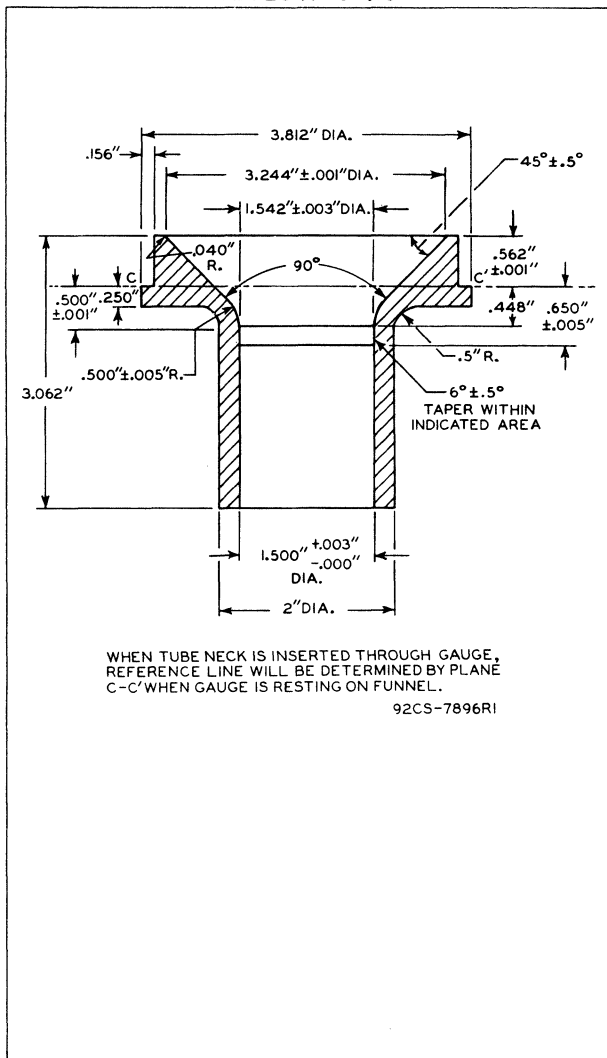


WHEN TUBE NECK IS INSERTED THROUGH GAUGE,
REFERENCE LINE WILL BE DETERMINED BY PLANE
C-C' WHEN GAUGE IS RESTING ON FUNNEL.

92CS-7391R1



REFERENCE-LINE GAUGE JETEC N^oG-116

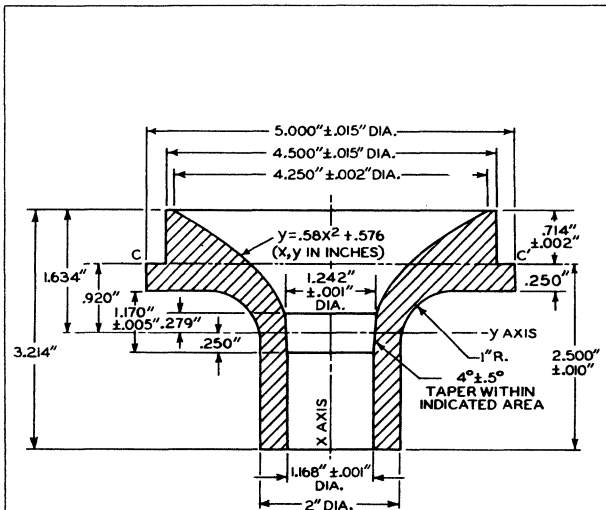


WHEN TUBE NECK IS INSERTED THROUGH GAUGE,
REFERENCE LINE WILL BE DETERMINED BY PLANE
C-C' WHEN GAUGE IS RESTING ON FUNNEL.

92CS-7896R1



REFERENCE-LINE GAUGE JETEC N^oG-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-9145R1



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.



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

X-RADIATION
PRECAUTIONS
3-62

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.





IEPI

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

IEPI

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 μf

Deflecting electrode DJ₁ to
deflecting electrode DJ₂ 1.7 μf

Deflecting electrode DJ₃ to
deflecting electrode DJ₄ 0.6 μf

DJ₁ to all other electrodes 5 μf

DJ₂ to all other electrodes 5 μf

DJ₃ to all other electrodes 3.8 μf

DJ₄ to all other electrodes 3.8 μf

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
DJ₄

Pin 7 - Deflecting
Electrode
DJ₃



Pin 8 - Ultor

(Grid No.2,

Grid No.4,

Collector)

Pin 9 - Deflecting
Electrode
DJ₂

Pin 10 - Deflecting
Electrode
DJ₁

Pin 11 - Internal
Connection-
Do Not Use

DJ₁ and DJ₂ are nearer the screen

DJ₃ and DJ₄ are nearer the base

IEPI



IEPI

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 $\pm 10^\circ$.

The angle between the trace produced by DJ_3 and DJ_4 and the trace produced by DJ_1 and DJ_2 is $90^\circ \pm 3^\circ$.

Maximum Ratings, Design-Center Values:

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_{c4}) between
recommended minimum* and 1500 volts

Grid-No.3 Voltage for Focus	10% to 30% of E_{c4}	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot.	-1.4% to -4.2% of E_{c4}	volts
Grid-No.3 Current for Any Operating Con- dition.	-15 to +10	μ amp
Deflection Factors:		
DJ_1 & DJ_2	210 to 310 vdc/in./kv of E_{c4}	
DJ_3 & DJ_4	240 to 350 vdc/in./kv of E_{c4}	
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 IEPI 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.



IEPI

IEPI

OSCILLOGRAPH TUBE

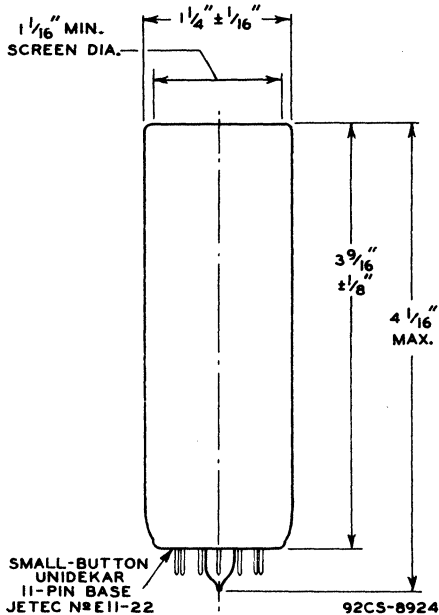
For ultor voltage of	500	1000	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot	-7 to -21	-14 to -42	volts
Deflection Factors:			
DJ ₁ & DJ ₂	105 to 155	210 to 310	volts dc/in.
DJ ₃ & DJ ₄	120 to 175	240 to 350	volts dc/in.

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.



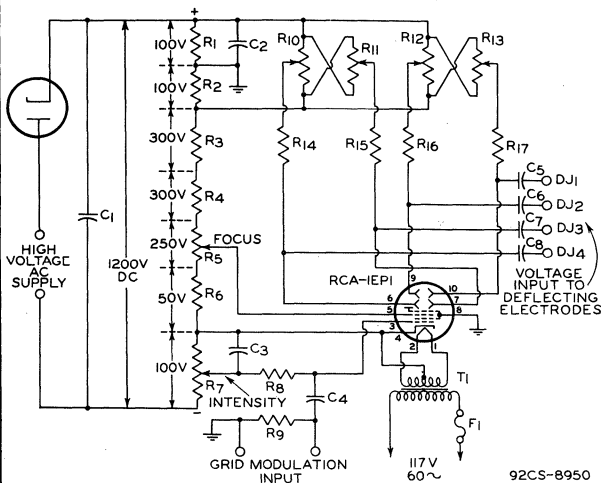
IEPI



IEPI

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



- C1: 0.5 μ f, 2000 volts
 C2: 1 μ f, 200 volts
 C3: 1 μ f, 200 volts
 C4: 0.05 μ f, 1600 volts
 C5 C6 C7 C8: 0.05 μ f, 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

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

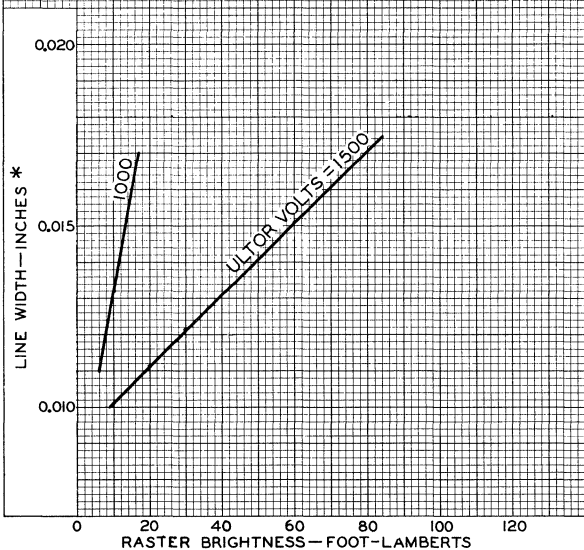


IEPI

IEPI

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. $\frac{1}{2}$ THAT AT CENTER OF LINE.



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8975R1

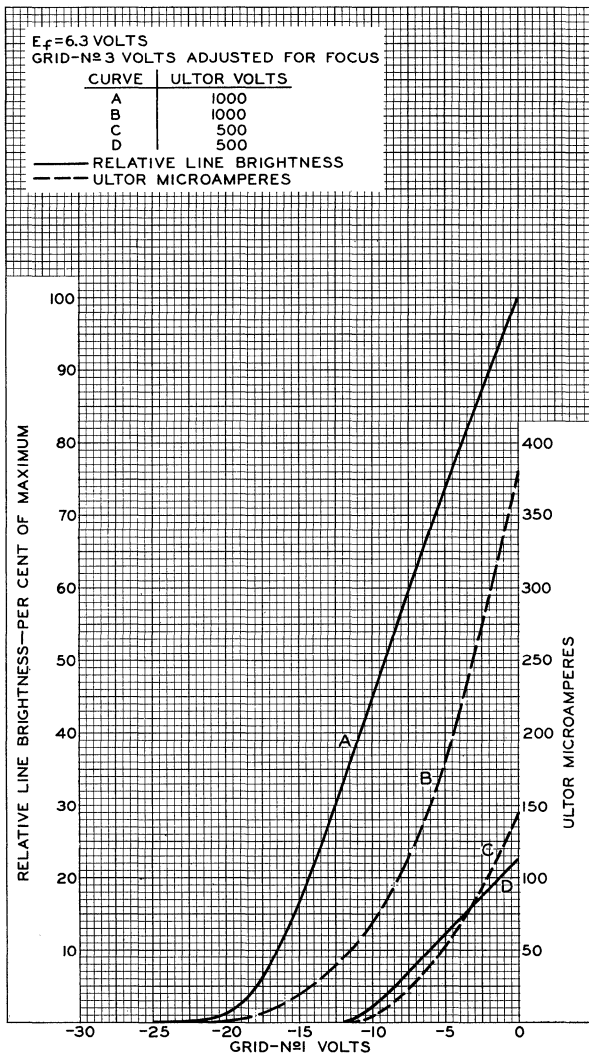




IEPI

IEPI

AVERAGE CHARACTERISTICS



TUBE DIVISION

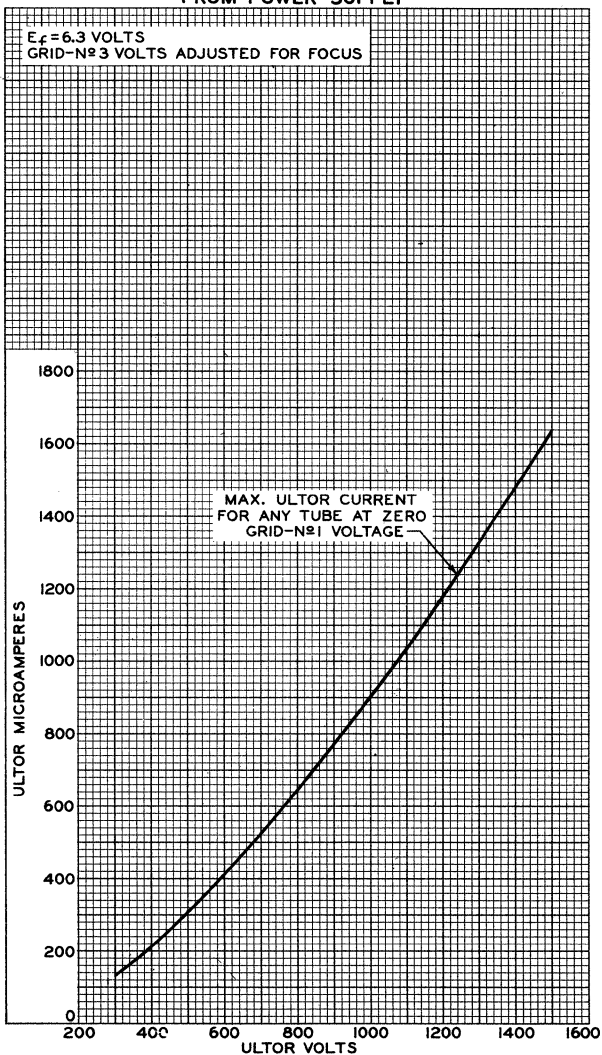
92CM-8938

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

IEPI



IEPI

MAXIMUM ULTOR-CURRENT REQUIREMENTS
FROM POWER SUPPLY $E_f = 6.3$ VOLTS
GRID-№3 VOLTS ADJUSTED FOR FOCUS

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8939



IEP2

IEP2

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

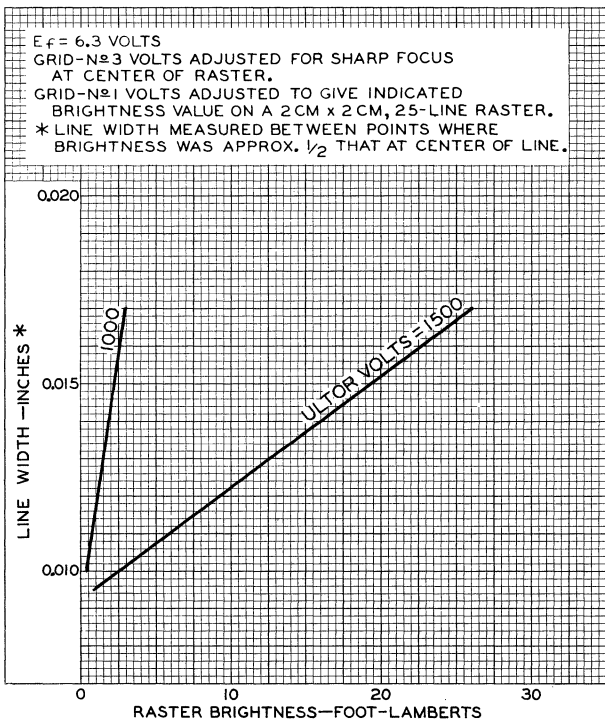
The 1EP2 is the same as the 1EP1 except for the following items:

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

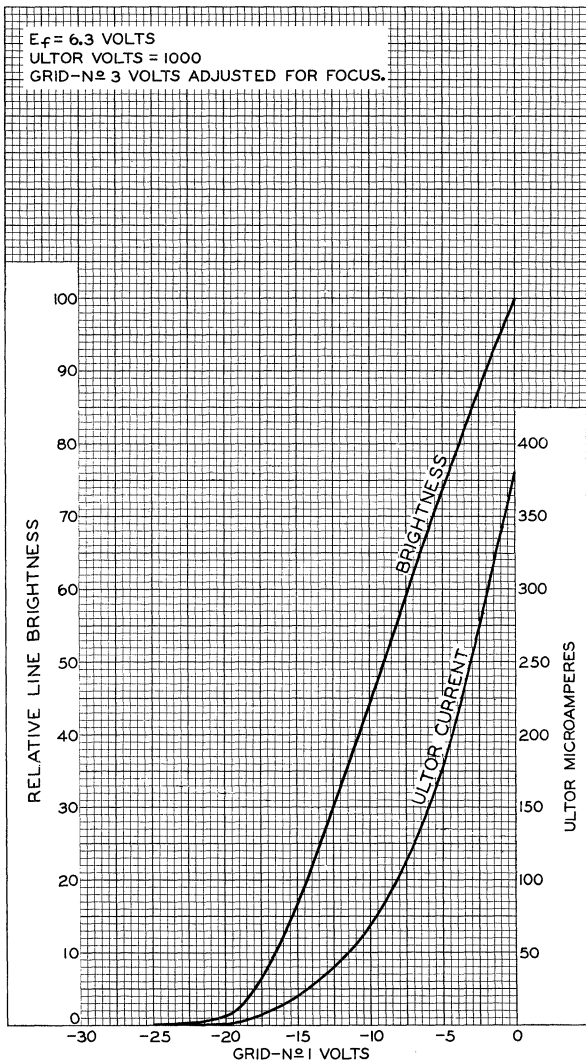


IEP2



IEP2

AVERAGE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9298



1EP11

1EP11

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

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

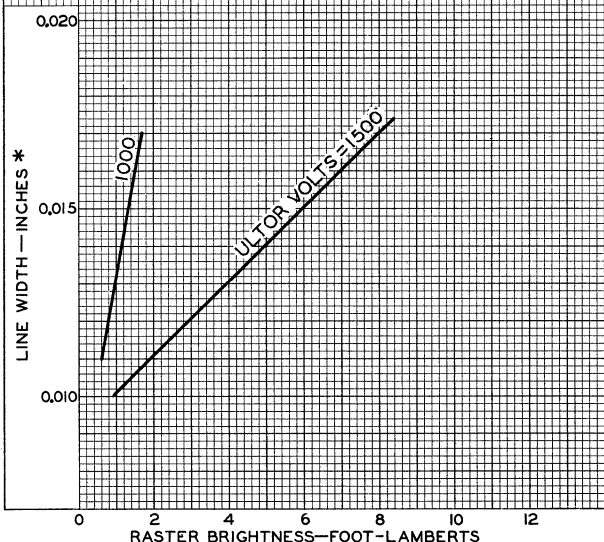
General:

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

$E_f = 6.3$ VOLTS
 GRID-N $\#$ 3 VOLTS ADJUSTED FOR SHARP FOCUS AT CENTER OF RASTER.
 GRID-N $\#$ 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. $\frac{1}{2}$ THAT AT CENTER OF LINE.



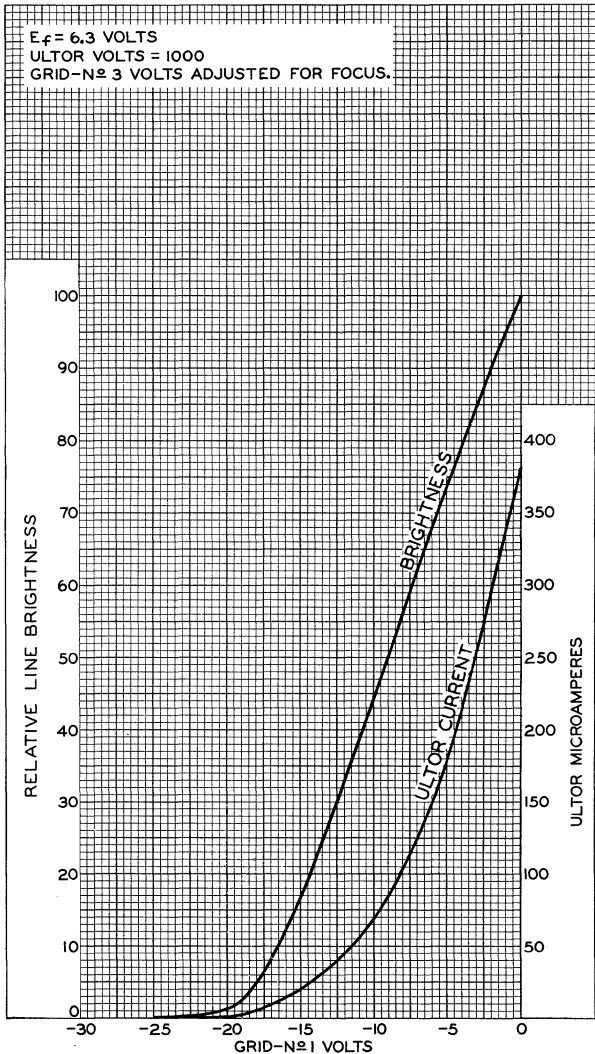
IEP11



IEP11

AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS
ULTOR VOLTS = 1000
GRID-N \approx 3 VOLTS ADJUSTED FOR FOCUS.



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9298



2AP1-A

HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 2AP1

2AP1-A

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	..	μf
Cathode to All Other Electrodes.	5.5	..	μf
DJ ₁ to DJ ₂	0.6	..	μf
DJ ₃ to DJ ₄	1.1	..	μf
DJ ₁ to All Other Electrodes.	8.5	..	μf
DJ ₃ to All Other Electrodes.	9.0	..	μf
DJ ₁ to All Other Electrodes except DJ ₂	8.0	..	μf
DJ ₂ to All Other Electrodes except DJ ₁	4.6	..	μf
DJ ₃ to All Other Electrodes except DJ ₄	7.5	..	μf
DJ ₄ to All Other Electrodes except DJ ₃	6.0	..	μf

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 Small Shell Magnal 11-Pin 11L

- | | | |
|--|--|--|
| Pin 1-Heater | | Pin 8-Deflecting Electrode DJ ₂ |
| Pin 2-Cathode | | Pin 9-Deflecting Electrode DJ ₃ |
| Pin 3-Deflecting Electrode DJ ₁ | | Pin 10-Grid No.1 |
| Pin 4-Anode No.1 | | Pin 11-Heater |
| Pin 5-No Connection | | |
| Pin 6-Deflecting Electrode DJ ₄ | | |
| Pin 7-Anode No.2, Grid No.2 | | |



*DJ₁ and DJ₂ are nearer the screen
DJ₃ and DJ₄ 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 angle between the trace produced by DJ₃ and DJ₄ and its intersection with the plane through the tube axis and pin 1 does not exceed 10°.

The angle between the trace produced by DJ₃ and DJ₄ and the trace produced by DJ₁ and DJ₂ is 90° ± 4°.

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 Volt- age 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 μ amp.			
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 \pm 50% of these values.

▲ See curve for average values.

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

Spot Position:

The undeflected focused spot will fall within a 10-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ₁ and DJ₂. Suitable test conditions are: anode-NO.2 voltage, 1000 volts; anode-NO.1 voltage, adjusted for focus; deflecting-electrode resistors, 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

JULY 1, 1945

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

DATA 1



2API-A

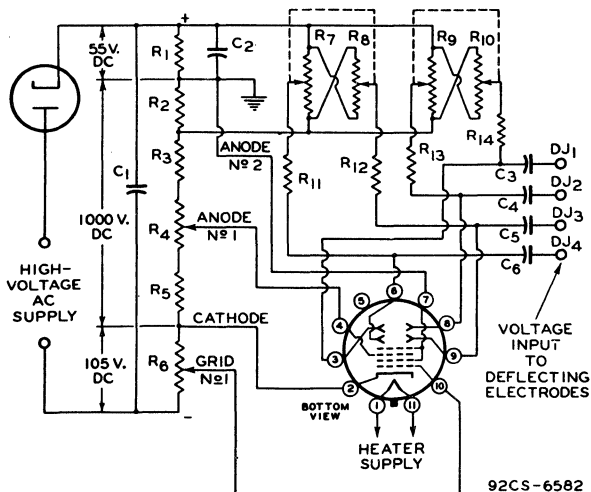
2API-A

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



92CS-6582

C1: 0.1 μ f
 C2: 1.0 μ f
 C3 C4 C5 C6: 0.05- μ f 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.

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

JULY 1, 1945

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

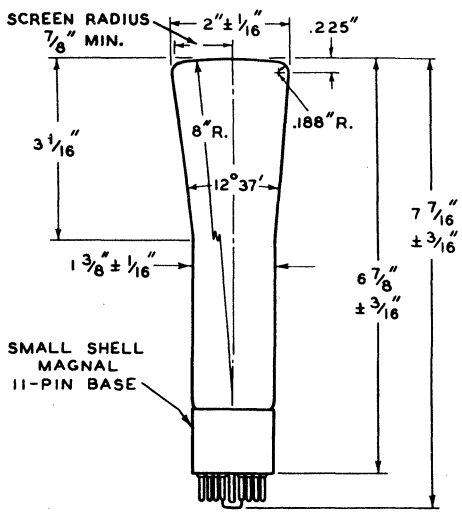
DATA 2

2API-A



2API-A

HIGH-VACUUM CATHODE-RAY TUBE



92CM-6368R2

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



2BPI

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

2BPI

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	$\mu\mu\text{f}$
DJ ₁ to DJ ₂	2	$\mu\mu\text{f}$
DJ ₃ to DJ ₄	2	$\mu\mu\text{f}$
DJ ₁ to All Other Electrodes	11	$\mu\mu\text{f}$
DJ ₂ to All Other Electrodes	8	$\mu\mu\text{f}$
DJ ₃ to All Other Electrodes	7	$\mu\mu\text{f}$
DJ ₄ to All Other Electrodes	8	$\mu\mu\text{f}$

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

Focusing Method Electrostatic

Deflection Method Electrostatic

Overall Length 7-5/8" \pm 3/16"

Greatest Diameter of Bulb 2" \pm 1/16"

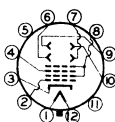
Minimum Useful Screen Diameter 1-3/4"

Mounting Position Any

Base Small-Shell Duodecal 12-Pin

Basing Designation for EOTTOM VIEW 12E

- | | |
|--|---|
| Pin 1-Heater | Pin 8-Anode No.2,
Grid No.2 |
| Pin 2-Grid No.1 | Pin 9-Deflecting
Electrode
DJ ₂ |
| Pin 3-Cathode | Pin 10-Deflecting
Electrode
DJ ₁ |
| Pin 4-Anode No.1 | Pin 11-Internal
Connection--
Do Not Use |
| Pin 5-Internal
Connection--
Do Not Use | Pin 12-Heater |
| Pin 6-Deflecting
Electrode
DJ ₃ | |
| Pin 7-Deflecting
Electrode
DJ ₄ | |



*DJ₁ and DJ₂ are nearer the screen
 DJ₃ and DJ₄ 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° \pm 3°.

← Indicates a change.



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_{b2}) between 500 and 2500 volts*

Anode-No.1 Voltage	15% to 28% of E_{b2}	volts
→ Max. Grid-No.1 Voltage for Visual Cutoff.	6.75% of E_{b2}	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_{b2}	
DJ ₃ & DJ ₄	74 to 100 v dc/in./kv of E_{b2}	
→ Spot Position.	□	

Examples of Use of Design Ranges:

<i>For anode-No.2 voltage of 1000</i>	<i>2000</i>	<i>volts</i>
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 ^o	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.

o 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.

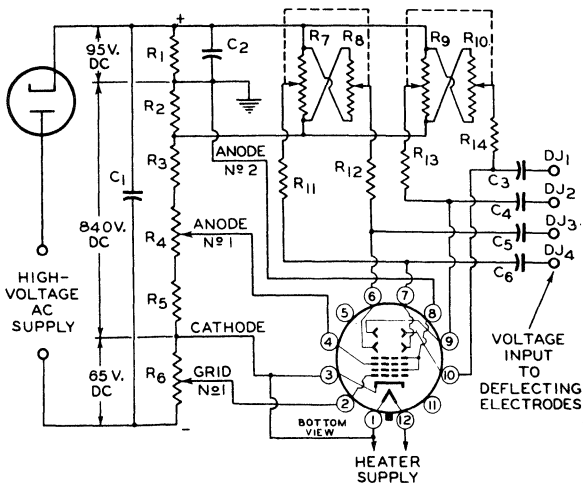


2BPI

OSCILLOGRAPH TUBE

2BPI

TYPICAL OSCILLOGRAPH CIRCUIT



92CM-6777R1

C1: 0.2 μ f
 C2: 1.0 μ f
 C3 C4 C5 C6: 0.05- μ f 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.

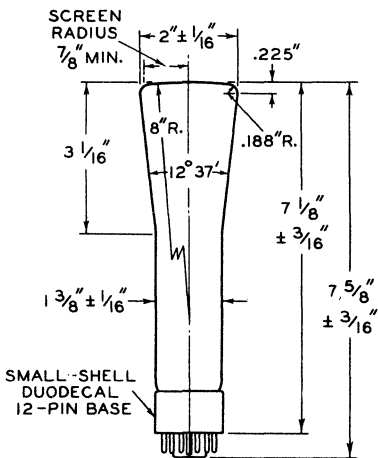
Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.

2BPI



2BPI

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.

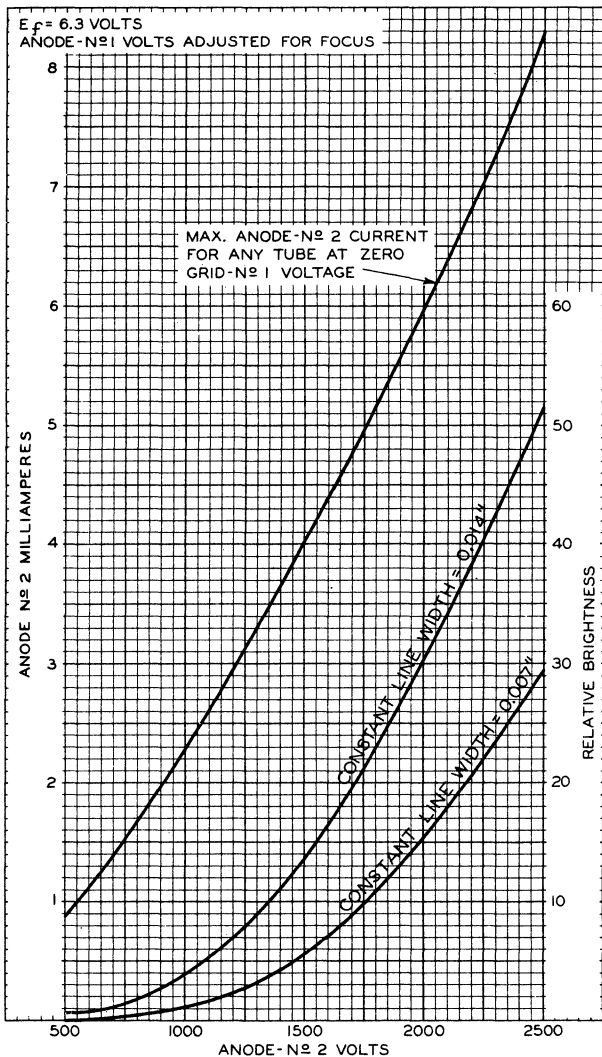
92CS-6689



2BP1

CHARACTERISTICS

2BP1



AUGUST 14, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6748R1

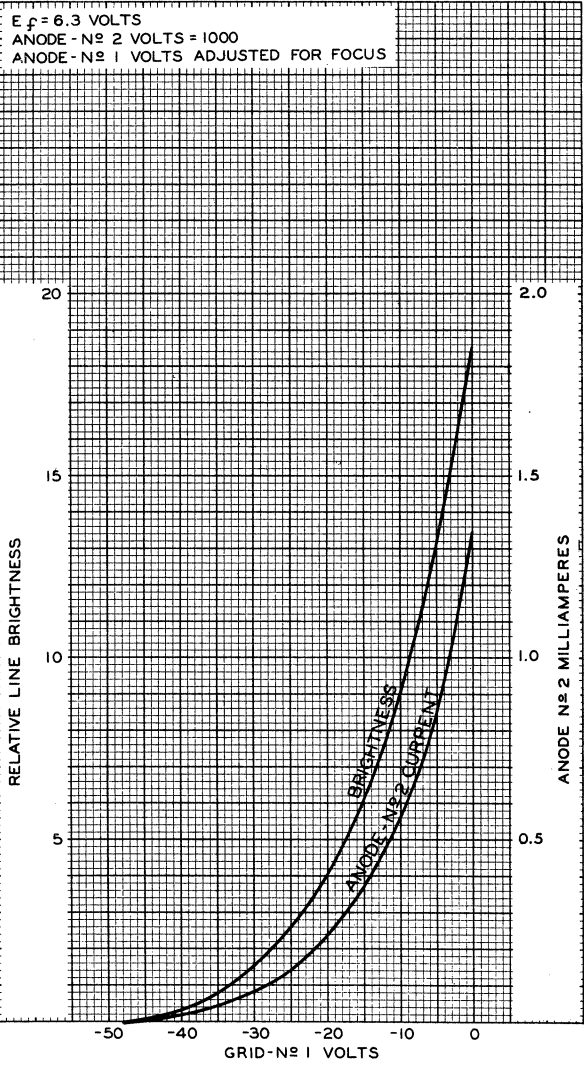
2BP1



2BP1

AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS
ANODE - N^o 2 VOLTS = 1000
ANODE - N^o 1 VOLTS ADJUSTED FOR FOCUS



AUGUST 14, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6747R1



2BP11

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

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	μf
Pattern Electrode to Grid No.4	5	μf

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.

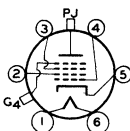
Caps (Two) Recessed Small Ball

Mounting Position. Any

Base Long-Shell Medium 6-Pin

Base Designation for BOTTOM VIEW 6BV

- | | |
|-----------------|--------------------|
| Pin 1-Heater | Pin 6 -Heater |
| Pin 2-Grid No.2 | End Cap -Pattern |
| Pin 3-Grid No.3 | Electrode |
| Pin 4-Grid No.1 | Side Cap-Grid No.4 |
| Pin 5-Cathode | |



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



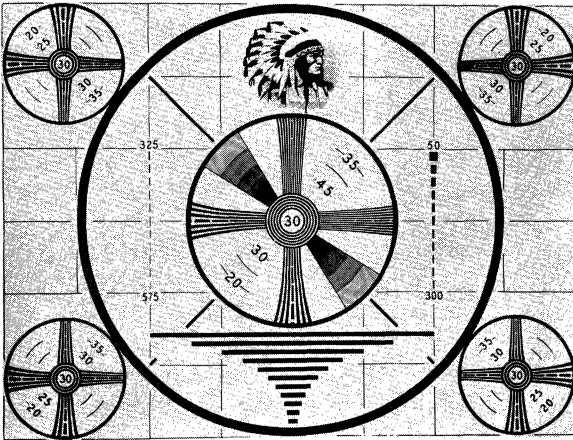
2F21

MONOSCOPE

Pattern-Electrode Signal Current	(Peak-to-Peak)	0.5 approx. μ amp
Resolution Capability^{▲▲}	.....	500 lines
Maximum Circuit Value:		
Grid-No.1-Circuit Resistance	.....	1.5 max. megohms

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

PATTERN

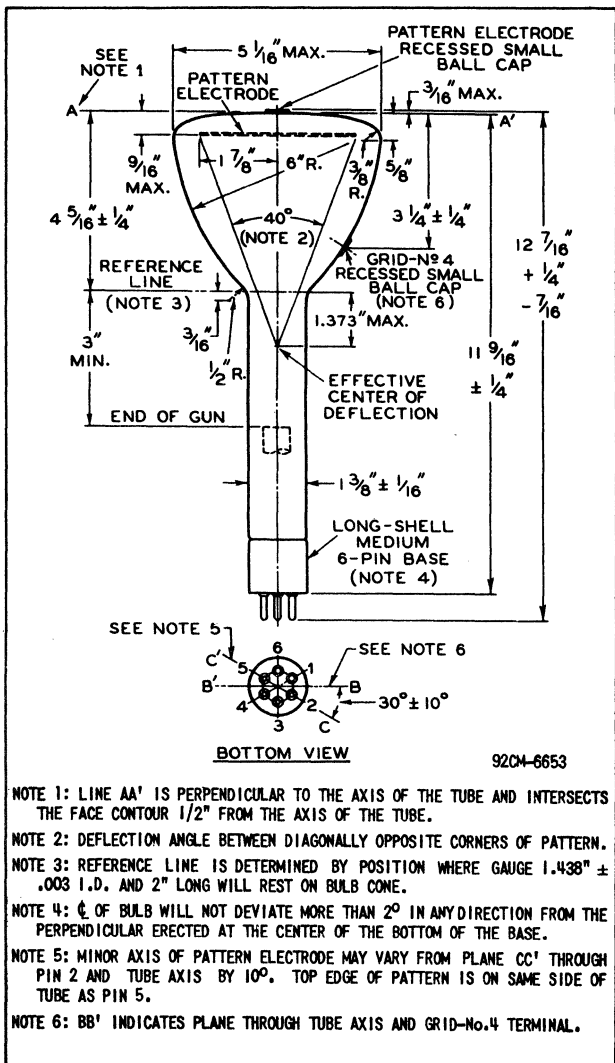


92CS-6665



2F21

2F21 MONOSCOPE



92CM-6653

①

②

③

④

⑤

⑥



3API-A

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

FOR RENEWAL USE



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"

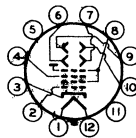
Operating Position.	Any
-----------------------------	-----

Bulb.	J24P1
---------------	-------

Base. .Small-Shell Duodecal 12-Pin (JEDEC Group 4, No.B12-43)

Basing Designation for BOTTOM VIEW. 12E

Pin 1 - Heater	Pin 8 - Ultor
Pin 2 - Grid No.1	(Grid No.2,
Pin 3 - Cathode	Grid No.4,
Pin 4 - Grid No.3	Collector)
Pin 5 - Internal Connection— Do Not Use	Pin 9 - Deflecting Electrode DJ ₂
Pin 6 - Deflecting Electrode DJ ₃	Pin 10 - Deflecting Electrode DJ ₁
Pin 7 - Deflecting Electrode DJ ₄	Pin 11 - Internal Con- nection— Do Not Use
	Pin 12 - Heater



*DJ₁ and DJ₂ are nearer the screen
DJ₃ and DJ₄ are nearer the base*



3AQPI

Maximum and Minimum Ratings, Design-Center Values:

ULTOR VOLTAGE.	} 2750 max. 500 min.	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_{c4}) between 500 and 2750 volts

Grid-No.3 Voltage for focus.	16.5% to 31% of E_{c4}	volts
Negative Grid-No.1 Voltage for visual extinction of undeflected spot	2.8% to 6.7% of E_{c4}	volts
Grid-No.3 Current for any operating condition.	-15 to +10	μ a
Deflection Factors:		
DJ ₁ & DJ ₂	73 to 99	v dc/in./kv of E_{c4}
DJ ₃ & DJ ₄	26 to 35	v dc/in./kv of E_{c4}





3BP1-A

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	μf
Cathode to All Other Electrodes	8.0	μf
DJ ₁ to DJ ₂	2.0	μf
DJ ₃ to DJ ₄	2.0	μf
DJ ₁ to All Other Electrodes	8.0	μf
DJ ₃ to All Other Electrodes	6.0	μf
DJ ₁ to All Other Electrodes except DJ ₂	6.0	μf
DJ ₂ to All Other Electrodes except DJ ₁	5.0	μf
DJ ₃ to All Other Electrodes except DJ ₄	4.0	μf
DJ ₄ to All Other Electrodes except DJ ₃	6.0	μf

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"

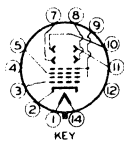
Minimum Useful Screen Diameter 2-3/4"

Mounting Position Any

Base Medium Shell Diheptal 12-Pin

Basing Designation for BOTTOM VIEW 14C

Pin 1-Heater	Pin 9-Anode No.2, Grid No.2
Pin 2-Cathode	Pin 10-Deflecting Electrode DJ ₂
Pin 3-Grid No.1	Pin 11-Deflecting Electrode DJ ₁
Pin 4-Internal Con. Do Not Use	Pin 12-No Conn.
Pin 5-Anode No.1	Pin 14-Heater
Pin 7-Deflecting Electrode DJ ₃	
Pin 8-Deflecting Electrode DJ ₄	



*DJ₁ and DJ₂ are nearer the screen
DJ₃ and DJ₄ are nearer the base*

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

The angle between the trace produced by DJ₁ and DJ₂ and its intersection with the plane through the tube axis and pin 5 does not exceed 10°.

The angle between the trace produced by DJ₃ and DJ₄ and the trace produced by DJ₁ and DJ₂ is 90° ± 30°.

Maximum Ratings, Absolute Values:

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

JULY 1, 1945

RCA VICTOR DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA 1

3BP1-A



3BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative Value	200 <i>max.</i>	volts
Positive Value	0 <i>max.</i>	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE		
	550 <i>max.</i>	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 <i>max.</i>	volts
Heater positive with respect to cathode	10 <i>max.</i>	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 Volt- age 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:			
DJ1 and DJ2	0.169	0.127 . .	mm/v dc
DJ3 and DJ4	0.229	0.172 . .	mm/v dc
Deflection Factor:**			
DJ1 and DJ2	150	200 . .	v dc/in.
DJ3 and DJ4	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 DJ1 and DJ2. 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 <i>max.</i>	megohms
Impedance of Any Deflecting-Electrode Circuit at Heater-Supply Frequency	1.0 <i>max.</i>	megohm
Resistance in Any Deflecting- Electrode Circuit ^{▲▲}	5.0 <i>max.</i>	megohms

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

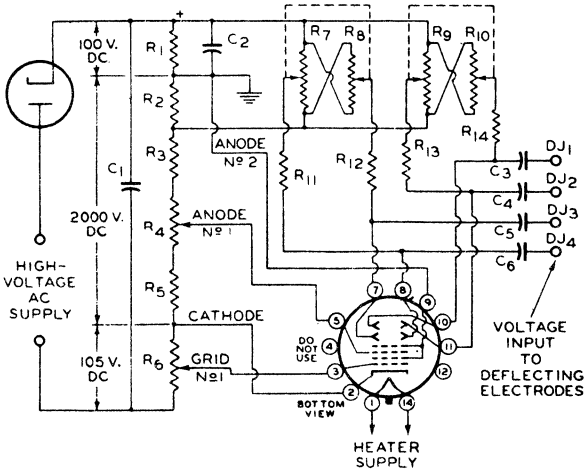


3BP1-A

3BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



92CS-6514

C1: 0.1 μ f
 C2: 1.0 μ f
 C3 C4 C5 C6: 0.05- μ f 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.

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

JULY 1, 1945

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

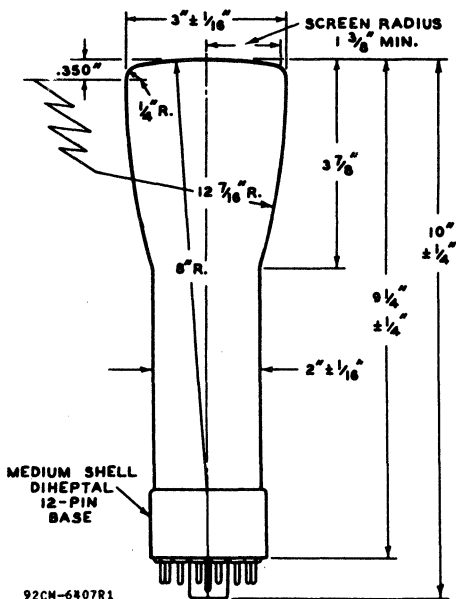
DATA 2

3BP1-A



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



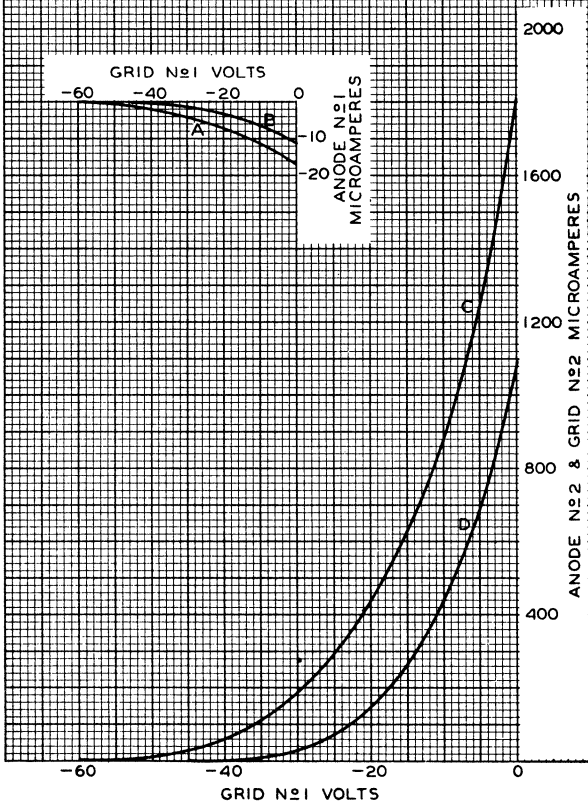
3BP1-A

3BP1-A

AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS
ANODE N^o1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE N ^o 2 & GRID N ^o 2 VOLTS
A	ANODE N ^o 1	2000
B	ANODE N ^o 1	1500
C	ANODE N ^o 2 & GRID N ^o 2	2000
D	ANODE N ^o 2 & GRID N ^o 2	1500





3JPI

3JPI

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	$\mu\mu\text{f}$
Cathode to All Other Electrodes.	8	$\mu\mu\text{f}$
DJ ₁ to DJ ₂	2.5	$\mu\mu\text{f}$
DJ ₃ to DJ ₄	2	$\mu\mu\text{f}$
DJ ₁ to All Other Electrodes.	8	$\mu\mu\text{f}$
DJ ₂ to All Other Electrodes.	7	$\mu\mu\text{f}$
DJ ₃ to All Other Electrodes.	7	$\mu\mu\text{f}$
DJ ₄ to All Other Electrodes.	8	$\mu\mu\text{f}$

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" \pm 1/4"

Greatest Diameter of Bulb. 3" \pm 1/16"

Minimum Useful Screen Diameter 2-3/4"

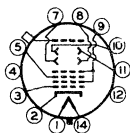
Mounting Position. Any

Cap. Recessed Small Ball (JETEC No.J1-22)

Base Medium-Shell Diheptal 12-Pin (JETEC No.B12-37)

Basing Designation for BOTTOM VIEW 14J₁

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



DJ₁ and DJ₂ are nearer the screen

DJ₃ and DJ₄ are nearer the base

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

The plane through the tube axis and each of the following items may vary from the trace produced by DJ₁ and DJ₂ 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 DJ₁ - DJ₂ trace and DJ₃ - DJ₄ trace is 90° \pm 3°.

3JPI



3JPI

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 (E_{b3}) between 2000* and 4000 volts
and any anode-No.2 voltage (E_{b2}) between 1500** and 2000 volts

Anode-No.1 Voltage	20% to 34.5% of E_{b2}	volts
Grid-No.1 Voltage†	1.5% to 4.5% of E_{b2}	volts
Anode-No.1 Current for any		
Operating Condition	-50 to +10	μ amp

Deflection Factors:

	<i>When $E_{b3} = 2 \times E_{b2}$</i>	
DJ ₁ & DJ ₂	85 to 115	v dc/in./kv of E_{b2}
DJ ₃ & DJ ₄	62.5 to 85	v dc/in./kv of E_{b2}
	<i>When $E_{b3} = E_{b2}$</i>	
DJ ₁ & DJ ₂	68 to 92	v dc/in./kv of E_{b2}
DJ ₃ & DJ ₄	50 to 68	v dc/in./kv of E_{b2}
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 3000 volts, anode-No.2 voltage of 1500 volts, anode-No.1 voltage adjusted for focus, grid-No.1 voltage adjusted to give spot that is just visible, each deflecting electrode connected through 1-megohm resistor to anode No.2, and 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 DJ₁ and DJ₂.

†: See next page.

AUG. 1, 1951

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA 1



3JPI

3JPI

OSCILLOGRAPH TUBE

Examples of Use of Design Ranges:

<i>For anode-No. 3</i>				
<i>voltage of</i>	2000	3000	4000	volts
<i>and anode-No. 2</i>				
<i>voltage of</i>	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 3JPI utilizes a medium-persistence screen having green fluorescence and phosphorescence. The screen has high visual efficiency and exceptionally good brightness contrast between the scanned line and the background. Under conditions of high ambient light, contrast may be maintained by the use of a green filter, such as Wratten No.58.

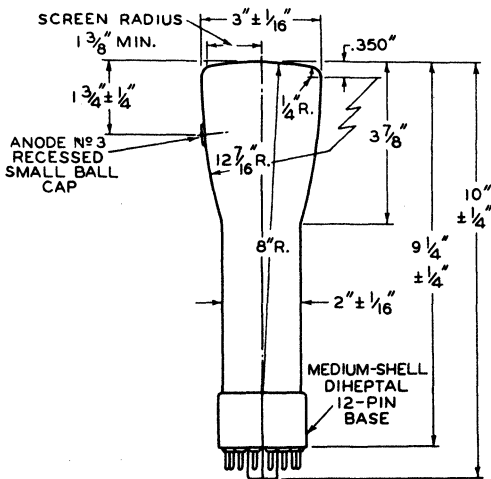
For high-speed scanning, it is recommended that the anode-No.3 (post-deflection accelerator) voltage be not less than 3000 volts, but for low- and medium-speed scanning, anode No.3 may be operated at a voltage as low as 2000 volts.

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

3JPI



3JPI OSCILLOGRAPH TUBE



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

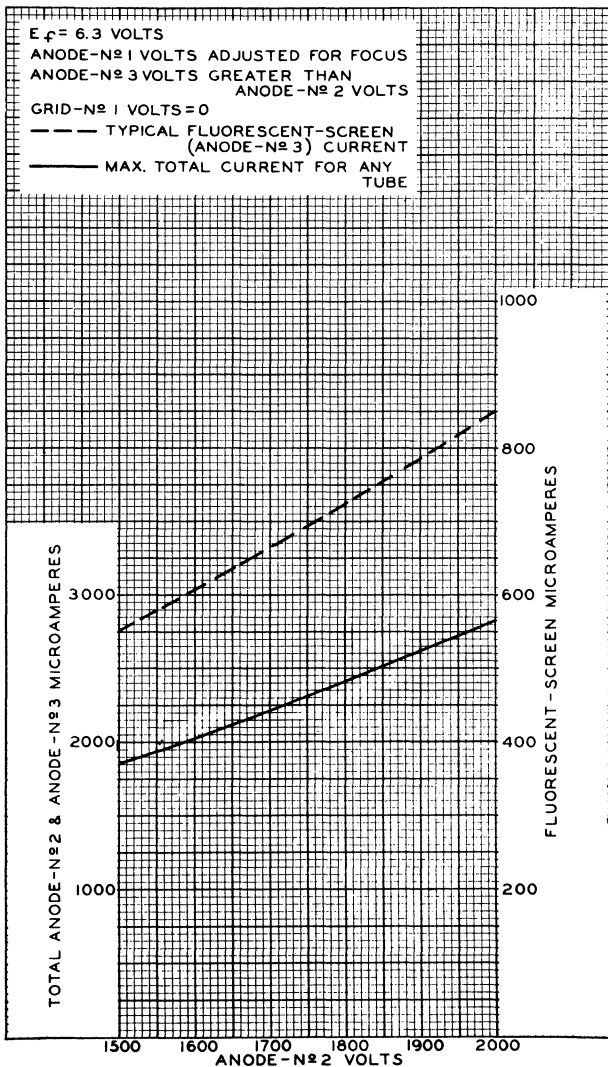
92CM-6583



3JPI

3JPI

CHARACTERISTICS



JUNE 22, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7671

3JPI

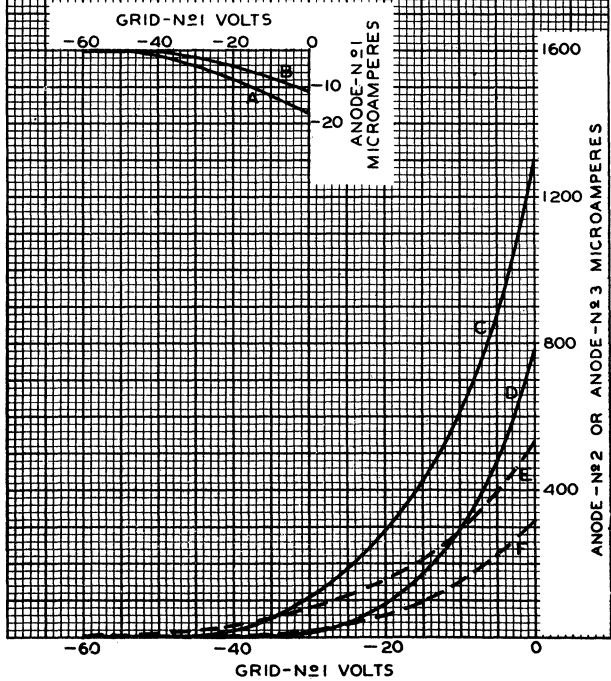


3JPI

AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS
 ANODE-Nº1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE-Nº2 VOLTS	ANODE-Nº3 VOLTS
A	ANODE Nº 1	2000	4000
B	ANODE Nº 1	1500	3000
C	ANODE Nº 2	2000	4000
D	ANODE Nº 2	1500	3000
E	ANODE Nº 3	2000	4000
F	ANODE Nº 3	1500	3000





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 DJ₁ and DJ₂.

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





3KPI

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

3KPI

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 DJ₁ to
deflecting electrode DJ₂ 2.5 μμf

Deflecting electrode DJ₃ to
deflecting electrode DJ₄ 2.5 μμf

DJ₁ to all other electrodes 11 μμf

DJ₂ to all other electrodes 8 μμf

DJ₃ to all other electrodes 7 μμf

DJ₄ 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
DJ₃

Pin 6 - Deflecting
Electrode
DJ₄

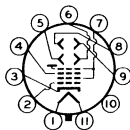
Pin 7 - Ultor
(Grid No.2,
Grid No.4,
Collector)

Pin 8 - Deflecting
Electrode
DJ₂

Pin 9 - Deflecting
Electrode
DJ₁

Pin 10 - Internal
Connection-
Do Not Use

Pin 11 - Heater



*DJ₁ and DJ₂ are nearer the screen
DJ₃ and DJ₄ are nearer the base*

← Indicates a change.

3KP1



3KP1

OSCILLOGRAPH TUBE

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 1 may vary from the trace produced by DJ₃ and DJ₄ by $\pm 10^\circ$ (measured about the tube axis).

The angle between DJ₁ - DJ₂ trace and DJ₃ - DJ₄ trace is $90^\circ \pm 3^\circ$.

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_{C4}) between
recommended minimum and 2500 volts*

Grid-No.3 Voltage for Focus	16% to 30% of E_{C4}	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	1.9% to 4.5% of E_{C4}	volts
Grid-No.3 Current for Any Operating Condi- tion	-15 to +10	μ amp
Deflection Factors:		
DJ ₁ & DJ ₂	50 to 68	v dc/in./kv of E_{C4}
DJ ₃ & DJ ₄	38 to 52	v dc/in./kv of E_{C4}
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.



3KPI

3KPI

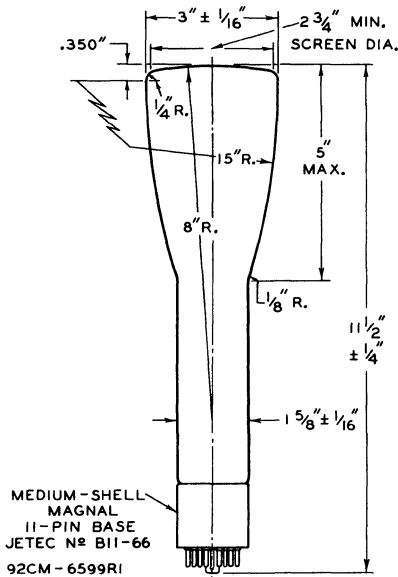
OSCILLOGRAPH TUBE

For ultor voltage of	1000	2000	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot	-19 to -45	-38 to -90	volts ←
Deflection Factors:			
DJ1 & DJ2	50 to 68	100 to 136	volts dc/in.
DJ3 & DJ4	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.

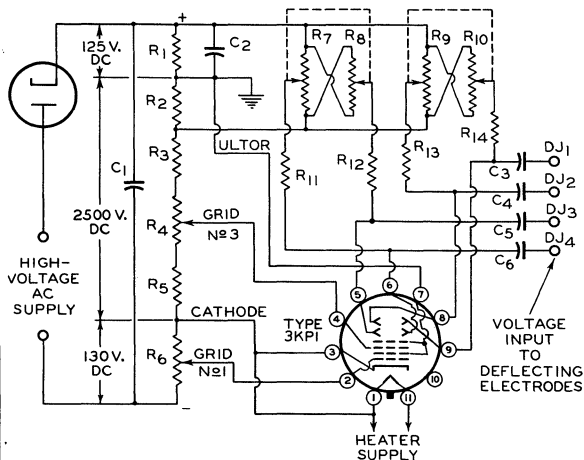
3KPI



3KPI

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



92CS-6690R2

- C1: 0.1 μ f, 3000 Volts
 C2: 1.0 μ f, 200 Volts
 C3 C4 C5 C6: 0.05- μ f 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.

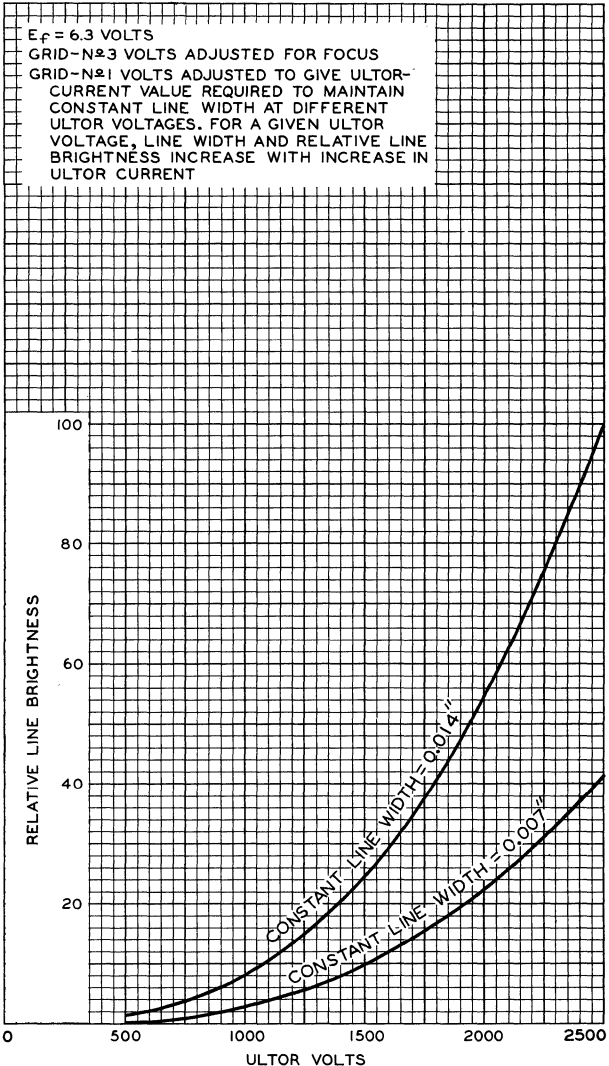
Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.



3KP1

3KP1

CHARACTERISTICS



0 500 1000 1500 2000 2500

ULTOR VOLTS

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

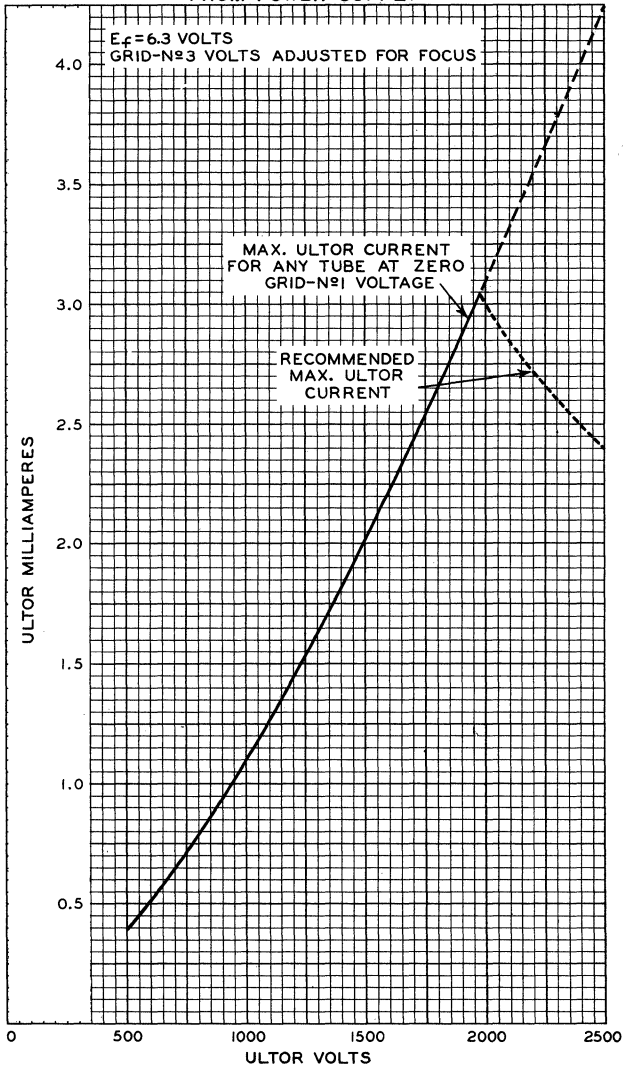
92CM-7191R2

3KPI



3KPI

MAXIMUM ULTOR-CURRENT REQUIREMENTS FROM POWER SUPPLY

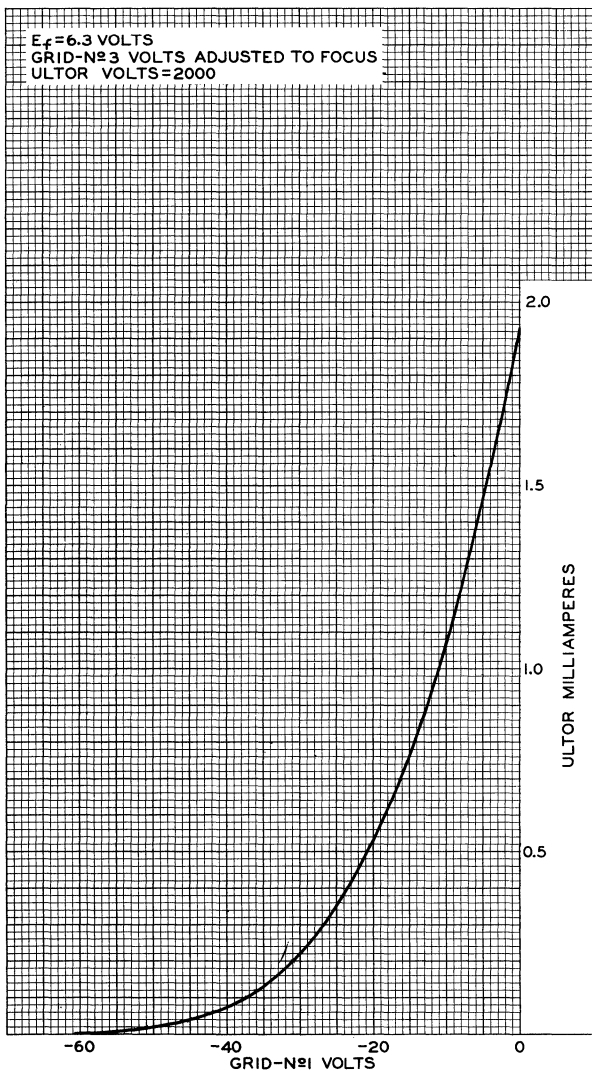




3KPI

3KPI

AVERAGE CHARACTERISTIC





3KP4

3KP4
TO
3KP11

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.

3KP16



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

3RP1

OSCILLOGRAPH TUBE

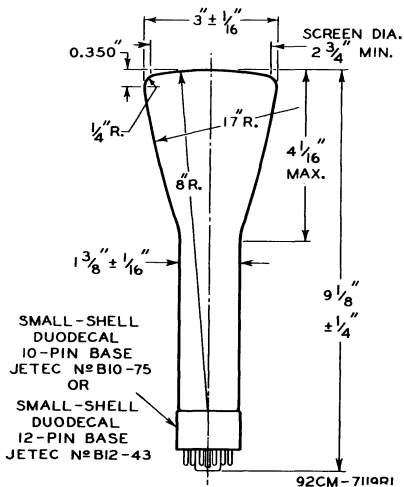
ELECTROSTATIC FOCUS

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.

10

11

12

13

14

15

16

17



3RP1-A

3RP1-A OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

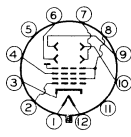
Voltage	6.3	ac or dc volts
Current	$0.6 \pm 10\%$	amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to all other electrodes	8	$\mu\mu\text{f}$
Deflecting electrode DJ ₁ to deflecting electrode DJ ₂	2	$\mu\mu\text{f}$
Deflecting electrode DJ ₃ to deflecting electrode DJ ₄	2	$\mu\mu\text{f}$
DJ ₁ to all other electrodes	11	$\mu\mu\text{f}$
DJ ₂ to all other electrodes	8	$\mu\mu\text{f}$
DJ ₃ to all other electrodes	7	$\mu\mu\text{f}$
DJ ₄ to all other electrodes	8	$\mu\mu\text{f}$

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. $9\text{-}1/8" \pm 1/4"$
Greatest Diameter of Bulb $3" \pm 1/16"$
Minimum Useful Screen Diameter. $2\text{-}3/4"$
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 8 - Ultron
Pin 2 - Grid No.1	(Grid No.2, Grid No.4, Collector)
Pin 3 - Cathode	
Pin 4 - Grid No.3	Pin 9 - Deflecting Electrode DJ ₂
Pin 5▲ - Internal Connection- Do Not Use	Pin 10 - Deflecting Electrode DJ ₁
Pin 6 - Deflecting Electrode DJ ₃	Pin 11▲ - Internal Connection- Do Not Use
Pin 7 - Deflecting Electrode DJ ₄	Pin 12 - Heater



*DJ₁ and DJ₂ are nearer the screen
DJ₃ and DJ₄ are nearer the base*

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

JULY 1, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA 1

3RP1-A



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 $90^\circ \pm 3^\circ$.

Maximum Ratings, Design-Center Values:

ULTOR ⁰ 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_{c4}) 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 Un- deflected Focused Spot	-6.75% of E_{c4}	volts
Grid-No.3 Current for Any Operating Con- dition	-15 to +10	μ amp
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.	##	

⁰ 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.



3RPI-A

3RPI-A

OSCILLOGRAPH TUBE

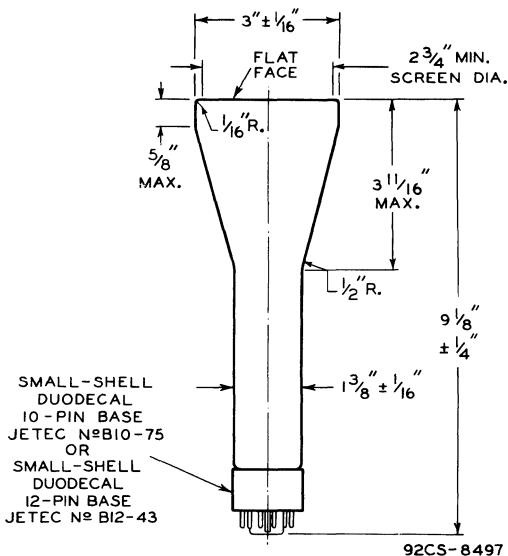
Examples of Use of Design Ranges:

For ultor voltages of	1000	2000	volts
Grid-No.3 Voltage			
for Focus.	165 to 310	330 to 620	volts
Maximum Grid-No.1			
Voltage for Visual			
Extinction of Un-			
deflected Focused			
Spot	-67.5	-135	volts
Deflection Factors:			
DJ ₁ & DJ ₂	73 to 99	146 to 198	volts dc/in.
DJ ₃ & DJ ₄	52 to 70	104 to 140	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.



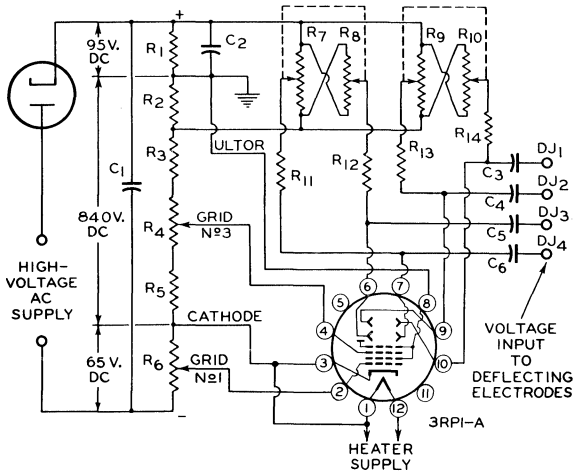
CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

3RP1-A



3RP1-A OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



92CS-6777RI

C1: 0.2 μ f
 C2: 1.0 μ f
 C3 C4 C5 C6: 0.05- μ f 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 ultor 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 ultor be returned to a point in the amplifier system which will give the lowest possible potential difference between ultor and the deflecting electrodes.

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

JULY 1, 1955

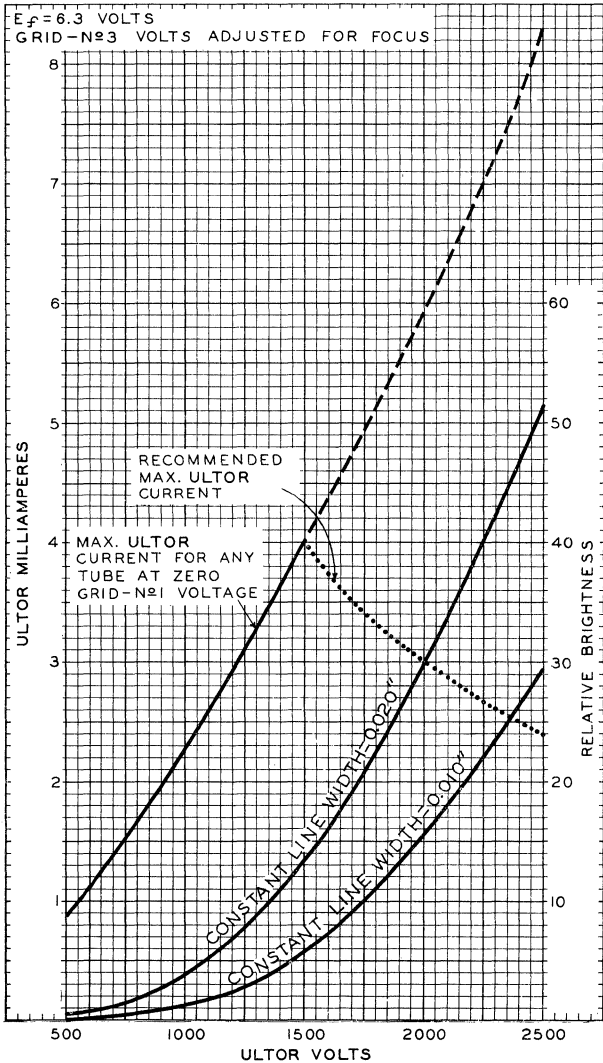
TUBE DIVISION
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-6777R1



3RPI-A

3RPI-A CHARACTERISTICS



MAR. 24, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

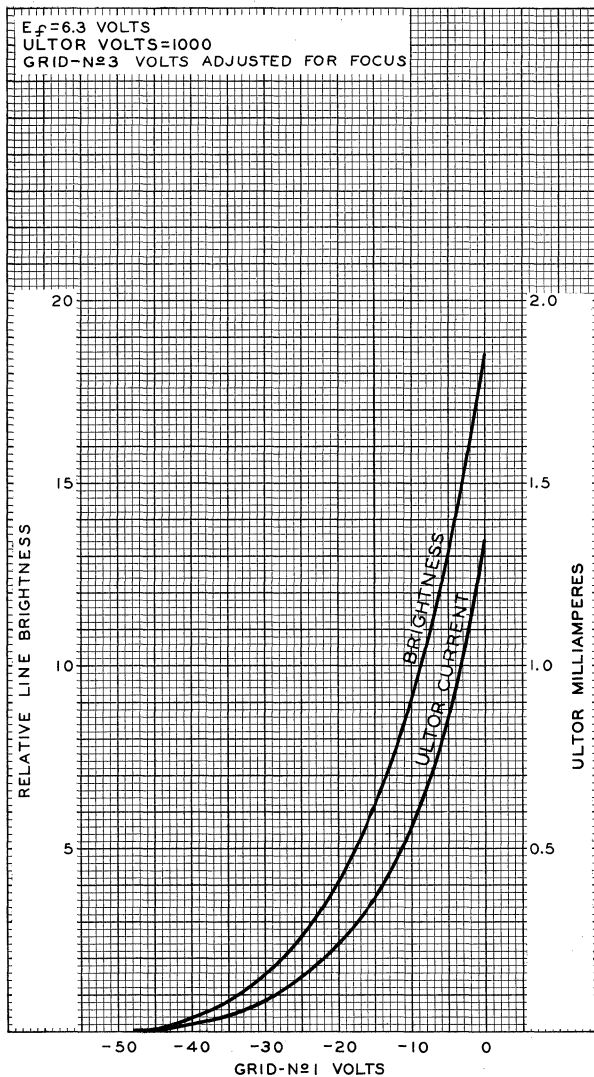
92CM-7143RI

3RP1-A



3RP1-A

AVERAGE CHARACTERISTICS



MAR. 24, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7141RI



3WPI

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

3WPI

DATA

General:

Heater, for Unipotential Cathode:
 Voltage 6.3 ac or dc volts
 Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:
 Grid No.1 to all other electrodes 4.6 to 8.7 $\mu\mu\text{f}$
 Cathode to all other electrodes 3 to 5.7 $\mu\mu\text{f}$
 Deflecting electrode DJ₁ to
 deflecting electrode DJ₂ 1.7 to 3.3 $\mu\mu\text{f}$
 Deflecting electrode DJ₃ to
 deflecting electrode DJ₄ 1 to 2 $\mu\mu\text{f}$
 DJ₁ to all other electrodes 5.5 to 10.5 $\mu\mu\text{f}$
 DJ₂ to all other electrodes 5.5 to 10.5 $\mu\mu\text{f}$
 DJ₃ to all other electrodes 3.5 to 6.8 $\mu\mu\text{f}$
 DJ₄ to all other electrodes 3.5 to 6.8 $\mu\mu\text{f}$

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 $11-1/2" \pm 1/8"$

Greatest Diameter of Bulb $3" \pm 1/16"$

Minimum Useful Screen Diameter $2-3/4"$

Minimum Useful Scan (Centered with respect to tube face):

By deflecting electrodes DJ₁ & DJ₂ $2-1/2"$

By deflecting electrodes DJ₃ & DJ₄ $2-1/4"$

Weight (Approx.) 1 lb

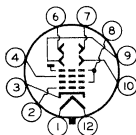
Mounting Position Any

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 8 - Ultor |
| Pin 2 - Grid No.1 | (Grid No.2, |
| Pin 3 - Cathode | Grid No.4, |
| Pin 4 - Grid No.3 | Collector) |
| Pin 6 - Deflecting
Electrode
DJ ₁ | Pin 9 - Deflecting
Electrode
DJ ₄ |
| Pin 7 - Deflecting
Electrode
DJ ₂ | Pin 10 - Deflecting
Electrode
DJ ₃ |
| | Pin 12 - Heater |



3WPI



3WPI

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_{C4}) between recommended minimum and 2500 volts*

Grid-No.3 Voltage		
for Focus.	16.5% to 31% of E_{C4}	volts
Grid-No.1 Voltage		
for Visual Ex-		
tinction of Unde-		
flected Focused		
Spot	-3% to -5% of E_{C4}	volts
Grid-No.3 Current		
for Any Operat-		
ing Condition.	-15 to +10	μ a
Deflection Factors:		
DJ ₁ & DJ ₂	41.5 to 50.5	v dc/in./kv of E_{C4}
DJ ₃ & DJ ₄	28.5 to 35	v dc/in./kv of E_{C4}
Spot Position.	##	

Examples of Use of Design Ranges:

	<i>For ultor voltage of</i>	<i>1000</i>	<i>1500</i>	<i>2000</i>	<i>volts</i>
Grid-No.3 Volt-					
age for Focus.	165 to 310	247 to 465	330 to 620		volts
Grid-No.1					
Voltage for					
Visual Ex-					
tinction of					
Undelected					
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 3WPI 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.



3WPI

3WPI

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 DJ₁ and DJ₂. 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.

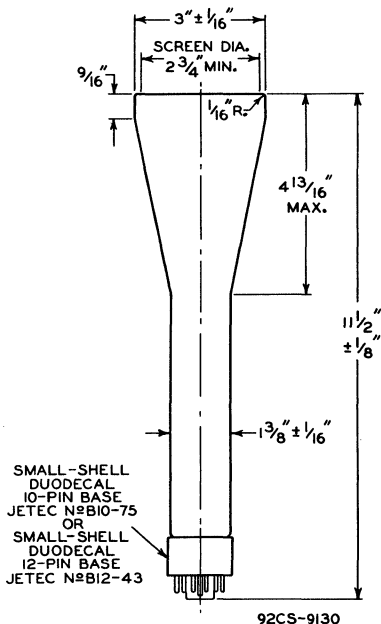
↓ The deflection factor for either DJ₁ and DJ₂ electrodes or DJ₃ and DJ₄ electrodes for a deflection of less than 75 per cent of the respective useful scan will not differ from the deflection factor for the corresponding deflecting electrodes at 25 per cent of the useful scan by more than 2 per cent.

3WPI



3WPI

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 $\pm 10^\circ$. ANGLE BETWEEN $DJ_1 - DJ_2$ TRACE AND $DJ_3 - DJ_4$ TRACE IS $90^\circ \pm 1^\circ$.

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

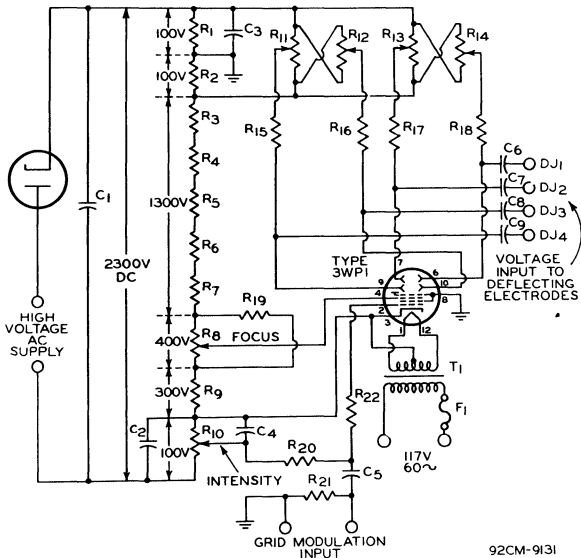


3WP1

3WP1

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



92CM-9131

- C1: 0.5 μ f, 3000 volts
- C2: 8 μ f, 250 volts
- C3: 1 μ f, 200 volts
- C4: 1 μ f, 200 volts
- C5: 0.05 μ f, 3000 volts
- C6 C7 C8 C9: 0.05 μ f, 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 T26F65.
- F1: 1-ampere fuse

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

3WPI



3WPI

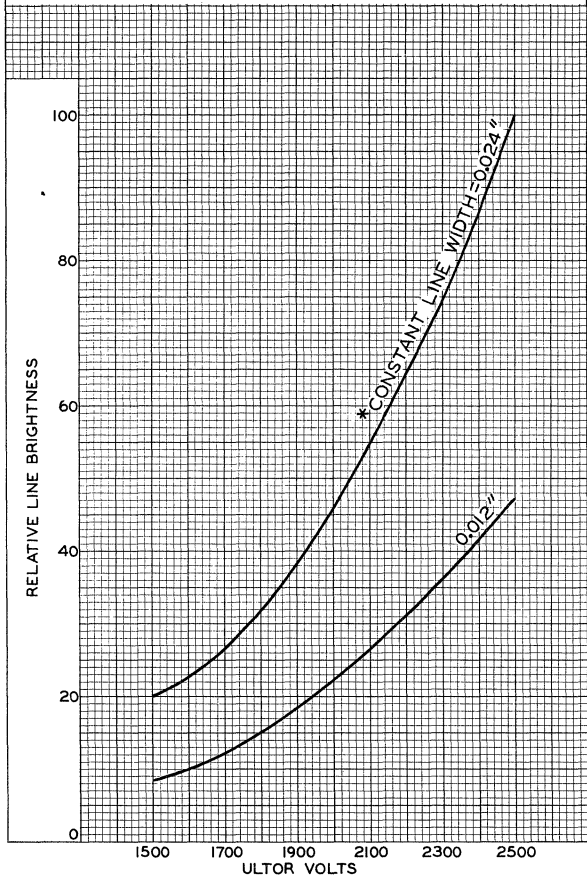
AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS

GRID-N₂3 VOLTS ADJUSTED FOR FOCUS.

GRID-N₂1 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.

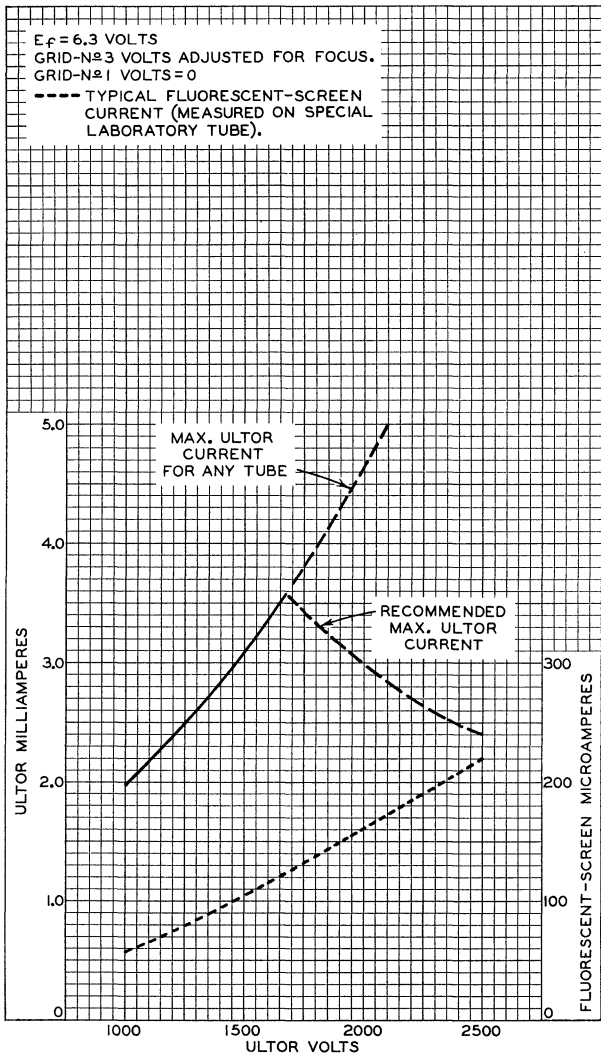




3WPI

3WPI

CHARACTERISTICS

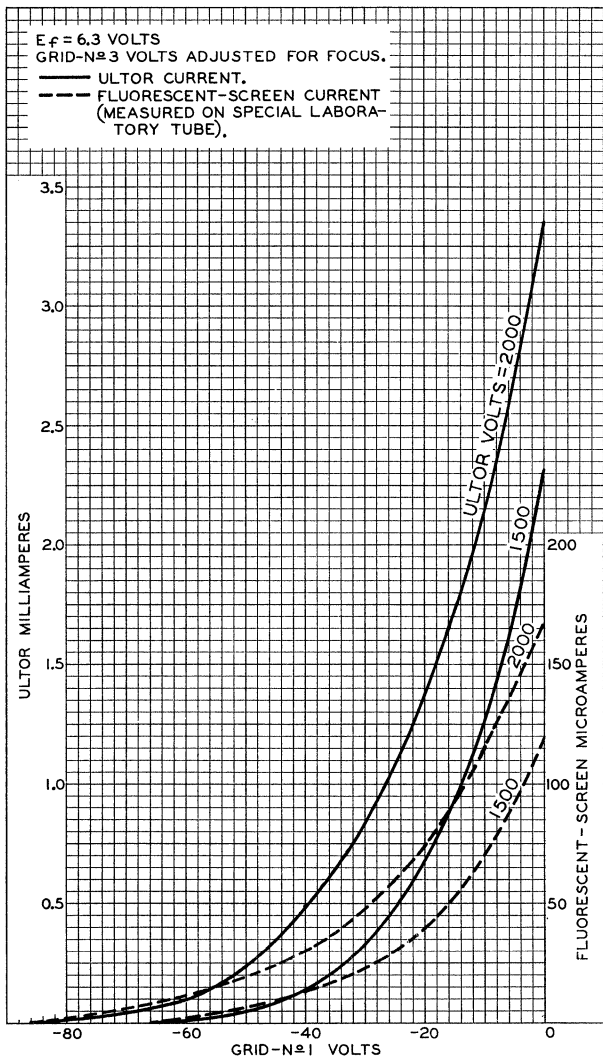


3WPI



3WPI

AVERAGE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9159



3WP2

3WP2
3WP11

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

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

General:

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

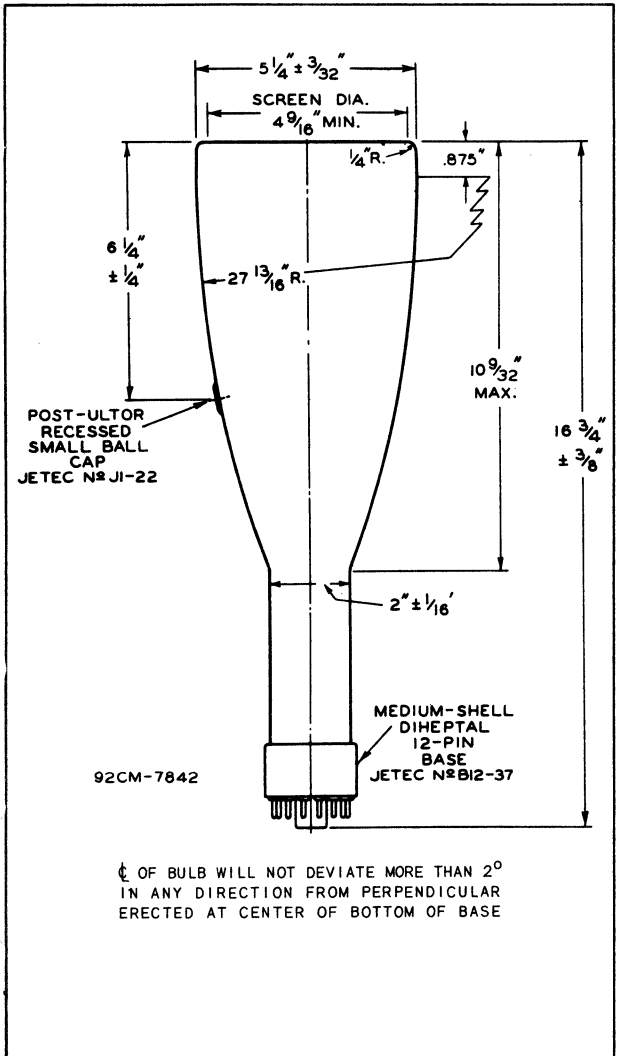




5ABPI

OSCILLOGRAPH TUBE

SABPI



JUNE 1, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

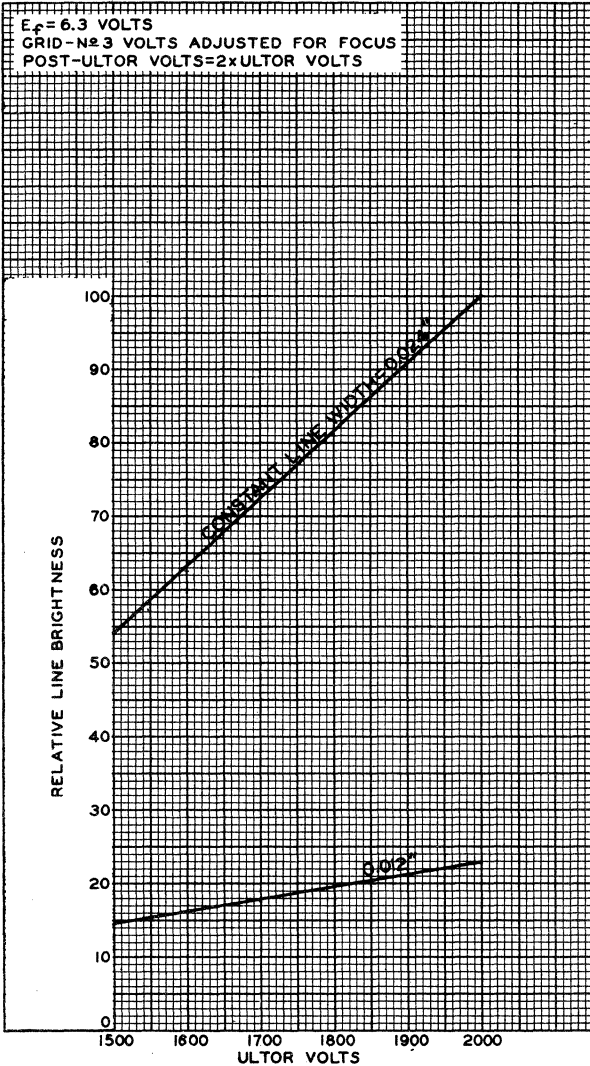
CE-7842

5ABPI



5ABPI

TYPICAL CHARACTERISTICS



FEB. 11, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

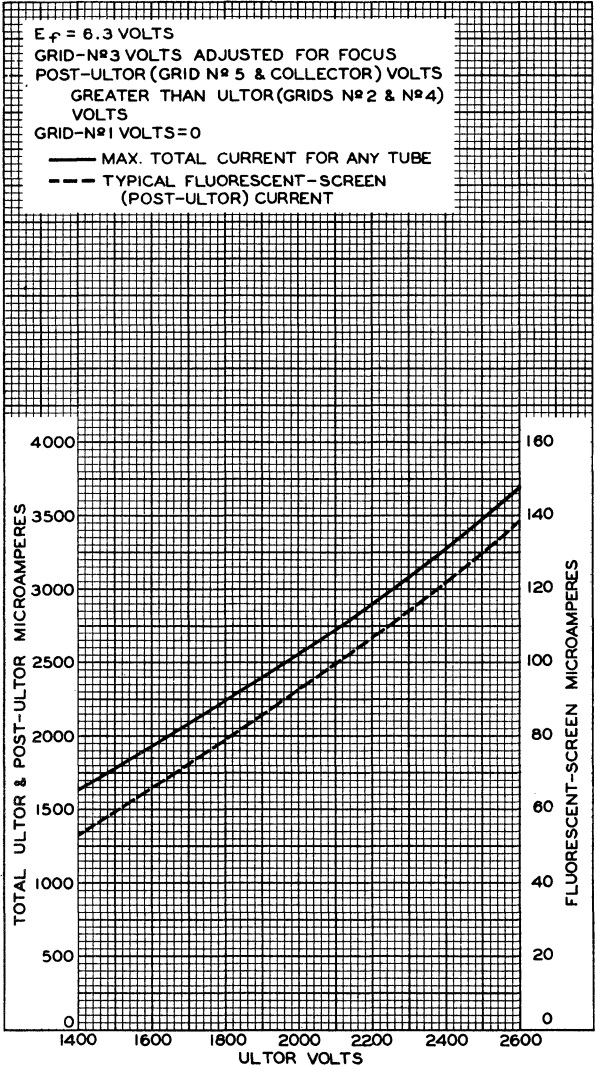
92CM-6620R1



5ABPI

5ABPI

CHARACTERISTICS



FEB. 3, 1953

TUBE DEPARTMENT

92CM-7910

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5ABPI

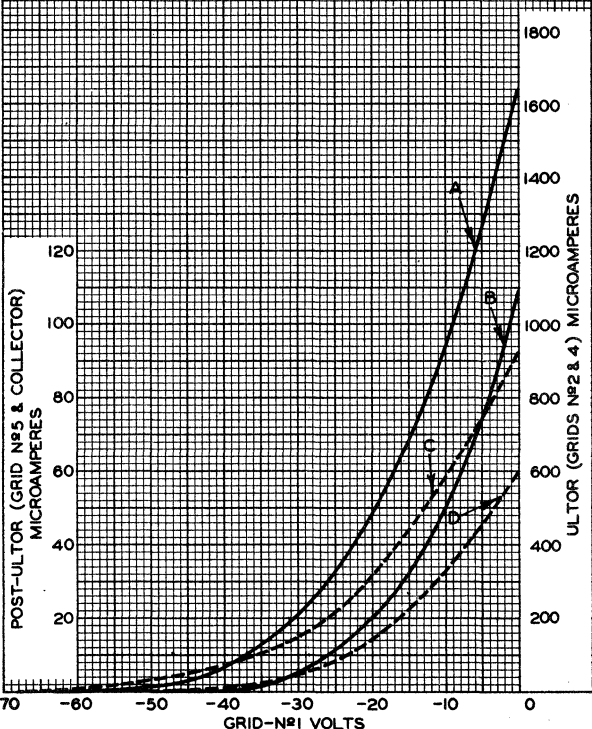


5ABPI

AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS
 GRID-N^o3 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



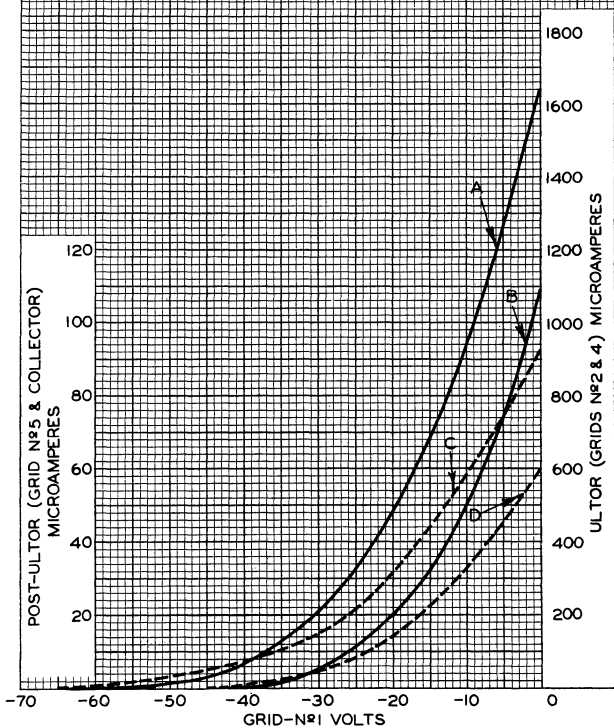
5ADPI

5ADPI

AVERAGE CHARACTERISTICS

 $E_f = 6.3$ VOLTSGRID-N^o3 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



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9099

5ADPI



5ADPI

CHARACTERISTICS

$E_f = 6.3$ VOLTS

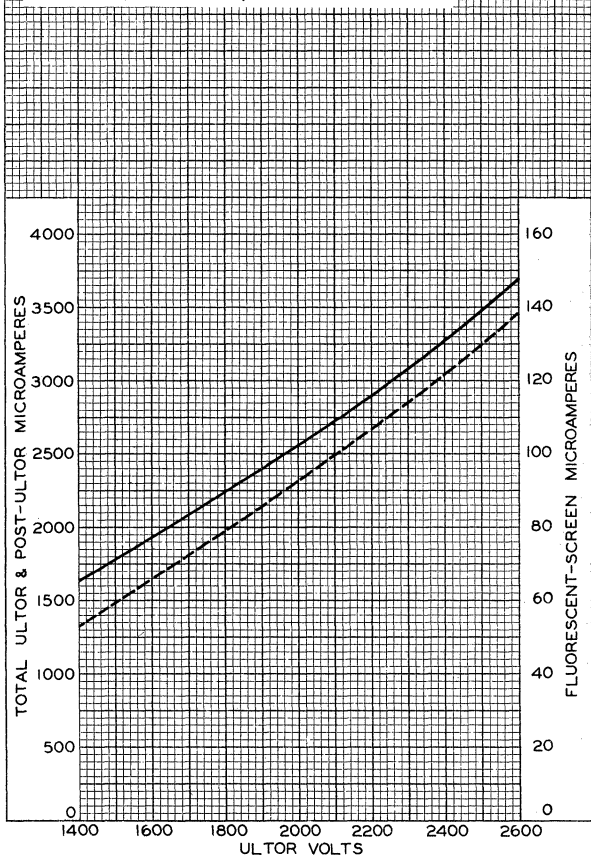
GRID-Nº3 VOLTS ADJUSTED FOR FOCUS.

POST-ULTOR (GRID Nº 5 & COLLECTOR) VOLTS
GREATER THAN ULTOR (GRIDS Nº 2 & Nº 4)
VOLTS.

GRID-Nº1 VOLTS=0

— MAX. TOTAL CURRENT FOR ANY TUBE.

- - - TYPICAL FLUORESCENT-SCREEN
(POST-ULTOR) CURRENT.



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

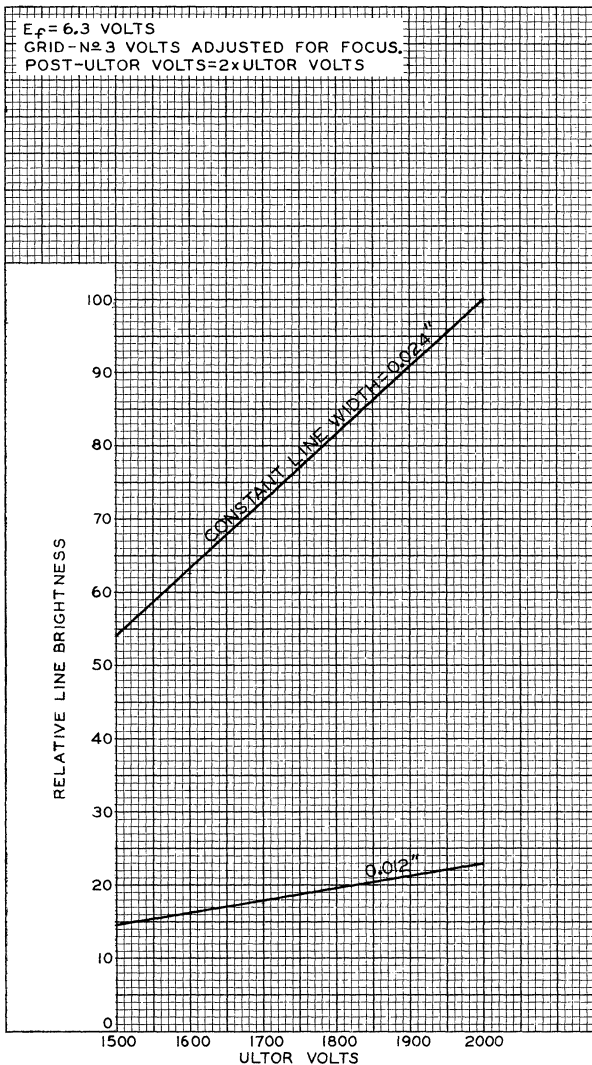
92CM-7910



5ADPI

5ADPI

TYPICAL CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6820R1

0

0

0

0

0

0



5ABP4
TO
5ABP11

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





5ADPI

5ADPI

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 ± 10%	amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes.	4.2 to 7.9	μμf
Cathode to all other electrodes.	3.1 to 5.8	μμf
Deflecting electrode DJ ₁ to deflecting electrode DJ ₂	1.7 to 3.1	μμf
Deflecting electrode DJ ₃ to deflecting electrode DJ ₄	0.7 to 1.3	μμf
DJ ₁ to all other electrodes.	4.4 to 9.2	μμf
DJ ₂ to all other electrodes.	4.4 to 9.2	μμf
DJ ₃ to all other electrodes.	2.8 to 5.3	μμf
DJ ₄ to all other electrodes.	2.8 to 6.3	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 16-3/4" ± 3/16"

Greatest Diameter of Bulb. 5-1/4" ± 3/32"

Minimum Useful Screen Diameter 4-1/2"

Weight (Approx.) 2-1/2 lbs

Mounting Position. Any

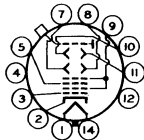
Cap. Recessed Small Ball (JETEC No.J1-22)

Bulb J42

Base Medium-Shell Diheptal 12-Pin (JETEC No.B12-37)

Basing Designation for BOTTOM VIEW 14J

- | | |
|--|--|
| Pin 1 - Heater | Pin 9 - Ultor |
| Pin 2 - Cathode | (Grid No.2,
Grid No.4) |
| Pin 3 - Grid No.1 | Pin 10 - Deflecting
Electrode
DJ ₂ |
| Pin 4 - No Connec-
tion-Do
Not Use | Pin 11 - Deflecting
Electrode
DJ ₁ |
| Pin 5 - Grid No.3 | Pin 12 - No Connec-
tion |
| Pin 7 - Deflecting
Electrode
DJ ₃ | Pin 14 - Heater
Cap - Post-Ultor
(Grid No.5,
Collector) |
| Pin 8 - Deflecting
Electrode
DJ ₄ | |



5ADPI



5ADPI

OSCILLOGRAPH TUBE

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	180 max.	volts
Heater positive with		
respect to cathode	180 max.	volts

Equipment Design Ranges:

With 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 Ex-		
tinction of Unde-		
flected Focused		
Spot	-2.25% to -3.75% of E_{c_4}	volts
Grid-No.3 Current		
for Any Operating		
Condition.	-15 to +10	μ amp
Deflection Factors:#		
When $E_{c_5} = 2 \times E_{c_4}$:		
DJ ₁ & DJ ₂	26.7 to 33.3	v dc/in./kv of E_{c_4}
DJ ₃ & DJ ₄	20.3 to 25	v dc/in./kv of E_{c_4}
When $E_{c_5} = E_{c_4}$:		
DJ ₁ & DJ ₂	21.5 to 26.5	v dc/in./kv of E_{c_4}
DJ ₃ & DJ ₄	16 to 20	v dc/in./kv of E_{c_4}
Spot Position.	##	

• 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.

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 the tube shielded from all extraneous fields, the center of the undeflected, focused spot will fall within a circle having an 8-mm radius concentric with the center of the tube face.

: See next page.



5ADPI

5ADPI

OSCILLOGRAPH TUBE

Examples of Use of Design Ranges:

With post-ultor voltage of	2000	3000	4000	volts
and ultor voltage of	2000	1500	2000	volts
Grid-No.3				
Voltage for Focus	400 to 690	300 to 515	400 to 690	volts
Grid-No.1				
Voltage for Visual Extinction of Undelected Focused Spot. .	-45 to -75	-34 to -56	-45 to -75	volts
Deflection Factors:#				
DJ ₁ & DJ ₂	43 to 53	40 to 50	53.4 to 66.6	v dc/in.
DJ ₃ & DJ ₄	32 to 40	30.5 to 37.5	40.6 to 50	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

SPECIAL PERFORMANCE DATA

With post-ultor voltage of	3000 volts
and ultor voltage of	1500 volts
Line Width [♠]	0.030 max. inch
Peak Grid-No.1 Drive from Spot Cutoff [♠]	45 max. volts
Raster Shape.	§

* The deflecting electrodes in the 5ADPI are designed to have extra-high deflection sensitivity and consequently produce less than full-screen deflection. With post-deflection acceleration, the length of deflection in either horizontal or vertical direction may be limited to 4-1/4 inches; without post-deflection acceleration, deflection to full screen diameter will ordinarily be obtained.

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

♠ Under the following conditions: heater voltage of 6.3 volts, brightness of 15 foot-lamberts measured on a 2" x 2", 49-line raster with high-frequency scanning applied to deflecting electrodes DJ₁ and DJ₂. For line-width measurement, the high-frequency scanning is adjusted to give a raster width of 12 cm with the grid-No.3 voltage adjusted to give sharpest focus at center of tube face. Raster height is contracted until individual scanning lines are just barely distinguishable. Line width is expressed 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).

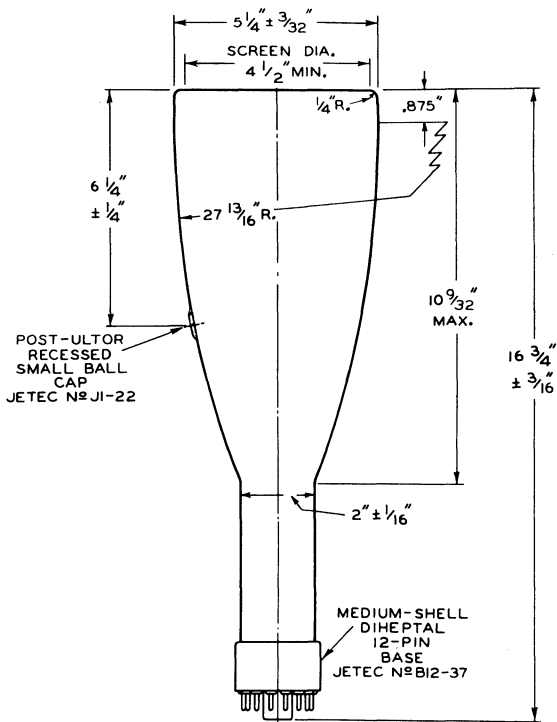
§ Under the following conditions: heater voltage of 6.3 volts, grid-No.3 voltage adjusted for focus, and grid-No.1 voltage adjusted to give visible raster. With 49-line raster, the size of which is adjusted so that the widest points on the raster just touch the sides of a square 3.075" on a side, no point on the raster sides will lie within an inscribed square 2.925" on a side having its sides parallel to the sides of the 3.075" square and its center at the center of the 3.075" square.

5ADPI



5ADPI

OSCILLOGRAPH TUBE



92CM-9098

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

THE PLANE THROUGH TUBE AXIS AND EACH OF THE FOLLOWING ITEMS MAY VARY FROM THE TRACE PRODUCED BY DJ_1 AND DJ_2 BY THE FOLLOWING ANGULAR TOLERANCES (MEASURED ABOUT THE TUBE AXIS): PIN 5, $\pm 10^{\circ}$; SIDE TERMINAL (ON SAME SIDE OF TUBE AS PIN 5), $\pm 10^{\circ}$. ANGLE BETWEEN $DJ_1 - DJ_2$ TRACE AND $DJ_3 - DJ_4$ TRACE IS $90^{\circ} \pm 1^{\circ}$.

DJ_1 AND DJ_2 ARE NEARER THE SCREEN. DJ_3 AND DJ_4 ARE NEARER THE BASE. WITH DJ_1 POSITIVE WITH RESPECT TO DJ_2 , THE SPOT WILL BE DEFLECTED TOWARD PIN 5; LIKEWISE, WITH DJ_3 POSITIVE WITH RESPECT TO DJ_4 , THE SPOT WILL BE DEFLECTED TOWARD PIN 2.



5AHP7, 5AHP7-A OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

5AHP7
5AHP7-A

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to all other electrodes. 6 μf Cathode to all other electrodes. 5 μf

Faceplate, Spherical Clear Glass

Phosphor (For curves, see front of this section)

Type 5AHP7

Type 5AHP7-A

P7

P7—Aluminized

Fluorescence Blue

Blue

Phosphorescence. Greenish-Yellow

Greenish-Yellow

Persistence. Long

Long

Focusing Method. Electrostatic

Deflection Method. Magnetic

Deflection Angle (Approx.) 53° Overall Length $11\text{--}1/8" \pm 1/4"$ Greatest Diameter of Bulb. $4\text{--}15/16" \pm 3/32"$ Minimum Useful Screen Diameter $4\text{--}1/4"$

Weight (Approx.) 1 lb 6 oz

Mounting Position. Any

Cap. Recessed Small Ball (JETEC No. J1-22)

Bulb J39-1/2

Base Medium-Shell Octal 8-Pin (JETEC No. B8-11),
or Long Medium-Shell Octal 8-Pin (JETEC No. B8-65)

Basing Designation for BOTTOM VIEW 8EF

Pin 1 - No Connection

Pin 2 - Heater

Pin 3 - Grid No.2

Pin 4 - Grid No.4

Pin 5 - Grid No.1

Pin 6 - No Connection

Pin 7 - Cathode

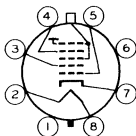
Pin 8 - Heater

Cap - Ultron

(Grid No.3,

Grid No.5,

Collector)

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

ULTOR VOLTAGE. 10000 max. volts

GRID-No.4 VOLTAGE:

Positive value 1000 max. volts

Negative value 500 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. 0 max. volts

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode. 180 max. volts

Heater positive with respect to cathode. 180 max. volts

*: See next page.

5AHP7
5AHP7-A



5AHP7, 5AHP7-A OSCILLOGRAPH TUBE

Equipment Design Ranges:

With any ultor voltage (E_{C5}) between 5000# and 10000 volts
and grid-No.2 voltage (E_{C2}) between 300 and 700 volts

Grid-No.4 Voltage for Focus with Ultor		
Current of 100 μ amp.	0% to 3.6% of E_{C5}	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot	-11% to -25.7% of E_{C2}	volts
Grid-No.4 Current.	-25 to +25	μ amp
Grid-No.2 Current.	-15 to +15	μ amp
Spot Position.	#	

Examples of Use of Design Ranges:

With ultor voltage of 7000 volts
and grid-No.2 voltage of 300 volts

Grid-No.4 Voltage for Focus with Ultor		
Current of 100 μ amp.	0 to 250	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot	-33 to -77	volts

Maximum Circuit Values:

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

SPECIAL PERFORMANCE DATA

Line Width:

For ultor voltage of 7000 volts. 0.013 max.▲ inch

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

Brilliance and definition decrease with decreasing ultor voltage. Recommended minimum ultor voltage for the 5AHP7 is 5000 volts; recommended minimum for the 5AHP7-A is 7000 volts.

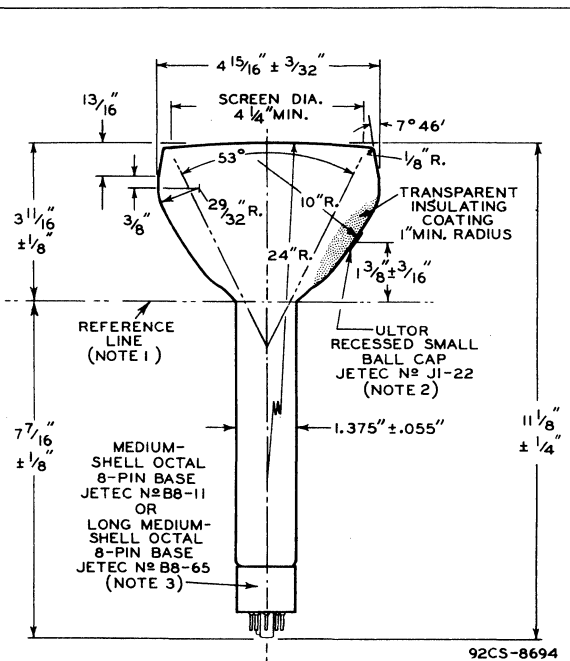
With the tube shielded from extraneous fields, the center of the undeflected, focused, low-intensity spot will fall within a circle having a 5/16-inch radius concentric with the center of the tube face.

▲ With JETEC Deflecting Yoke No.120, or equivalent, and under the following conditions: heater voltage of 6.3 volts, ultor current of 100 microamperes, grid-No.2 voltage of 300 volts, and a 49-line raster. Raster width is adjusted to 11.4 cm and the grid-No.4 voltage 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 center line of the tube face divided by the number of scanning lines (49).



5AHP7, 5AHP7-A OSCILLOGRAPH TUBE

5AHP7
5AHP7-A



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 $\pm 10^{\circ}$. 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: ϕ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

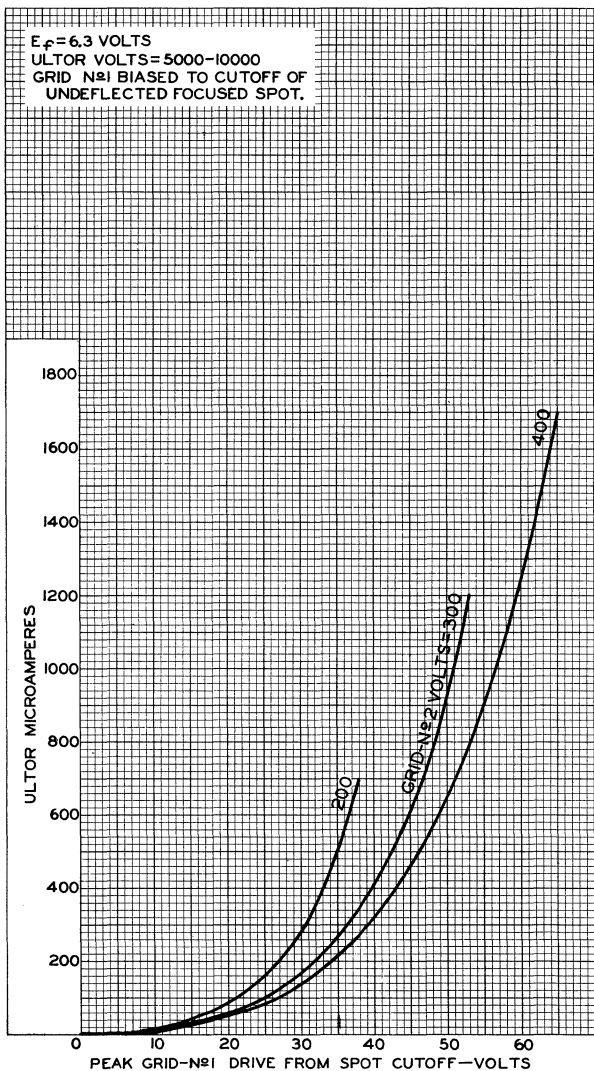
5AHP7
5AHP7-A



5AHP7, 5AHP7-A

AVERAGE GRID-DRIVE CHARACTERISTICS

$E_f = 6.3$ VOLTS
ULTOR VOLTS = 5000-10000
GRID N^o1 BIASED TO CUTOFF OF
UNDEFLECTED FOCUSED SPOT.



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9088



5AUP24

5AUP24

COLOR FLYING-SPOT CATHODE-RAY TUBE

HIGH-RESOLUTION CAPABILITY
ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

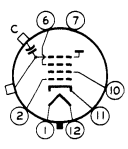
For use as flying-spot scanner in color video-signal generators

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. μμf
	{ 100 min. 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 <i>Operating Considerations</i>
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.



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_{C4}) between 20000* and 27000 voltsGrid-No.3 Voltage for focus
with ultor current of 200 μa 17% to 21.5% of E_{C4} voltsGrid-No.2 Voltage when circuit
design utilizes fixed grid-
No.1 voltage (E_{C1}) for visual
extinction of undeflected fo-
cused spot 2 to 5 times E_{C1} voltsGrid-No.1 Voltage for visual
extinction of undeflected fo-
cused spot when circuit design
utilizes grid-No.2 voltage
(E_{C2}) at fixed value 20% to 50% of E_{C2} voltsMaximum 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 voltsGrid-No.2 Voltage when circuit
design utilizes fixed grid-
No.1 voltage of -70 volts for
visual extinction of undeflec-
ted focused spot 140 to 350 voltsGrid-No.1 Voltage for visual
extinction of undeflected fo-
cused 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.



5AUP24

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.

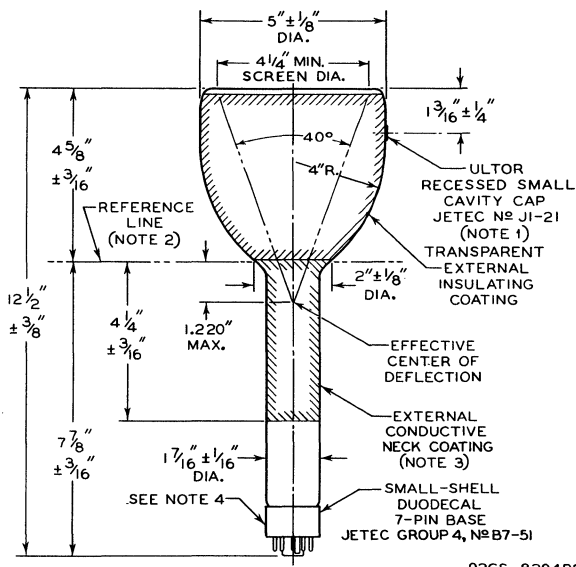
When in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data. It is also recommended that a series limiting resistance of 50,000 ohms be placed in both the ultor and 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.



5AUP24

COLOR FLYING-SPOT CATHODE-RAY TUBE



92CS-8294R2

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION 3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTROR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. ULTROR 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 GROUND.

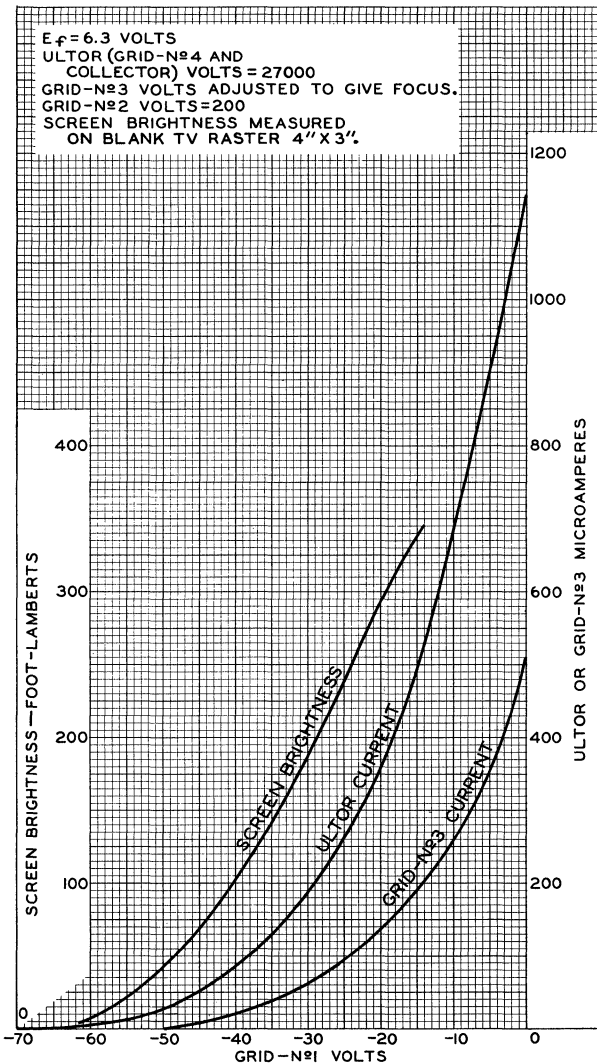
NOTE 4: ϕ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.



5AUP24

5AUP24

AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION

92CM-8343RI

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY





5AYP4

5AYP4

VIEW-FINDER KINESCOPE

METAL-BACKED SCREEN

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	μf
Cathode to all other electrodes	5	μf
External conductive coating to ultor	{ 750 max.	μf
	{ 500 min.	μf

Faceplate, Spherical Clear Glass

Phosphor (For curves, see front of this section) . . P4-Sulfide Type, Metal-Backed

Fluorescence White

Phosphorescence White

Persistence Short

Focusing Method Electrostatic

Deflection Method Magnetic

Deflection Angle (Approx.) 53°

Overall Length 11-9/16" ± 3/8"

Greatest Diameter of Bulb 4-15/16" ± 3/32"

Minimum Useful Screen Diameter 4-1/4"

Picture Size (within minimum-useful-screen area) . 3-3/8" x 2-1/2"

Weight (Approx.) 1 lb 6 oz

Mounting Position Any

Ultor[•] Terminal . . . Recessed Small Ball Cap (JETEC No. J1-22)

Bulb J-39-1/2

Base Long Medium-Shell Octal 8-Pin (JETEC No. B8-65)

BOTTOM VIEW

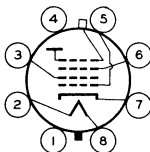
Pin 1 - No Connection

Pin 2 - Heater

Pin 3 - Grid No.2

Pin 4 - No Connection

Pin 5 - Grid No.1



Pin 6 - Grid No.3

Pin 7 - Cathode

Pin 8 - Heater

Cap - Ultor
(Grid No.4,
Collector)

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE[•] 10000 max. volts

GRID-No.3 VOLTAGE 1500 max. volts

GRID-No.2 VOLTAGE 410 max. 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 5AYP4, the ultor function is performed by grid No.4. Since grid No.4 and collector are connected together within the 5AYP4, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

5AYP4



5AYP4

VIEW-FINDER KINESCOPE

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.	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

For any ultor voltage (E_{C1}) between 5000* and 10000 volts
and grid-No.2 voltage (E_{C2}) between 200 and 410 volts

Grid-No.3 Voltage for Focus with Ultor Current of 100 μ amp	9.8% to 14.1% of E_{C4}	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	8.5% to 23.5% of E_{C2}	volts
Max. Grid-No.3 Current**	See Curves	
Grid-No.2 Current.	-15 to +15	μ amp
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

For ultor voltage of	7000	10000	volts
and grid-No.2 voltage of	200	300	volts

Grid-No.3 Voltage for Focus with Ultor Current of 100 μ amp.	680 to 990	980 to 1410	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-17 to -47	-25 to -71	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 5000 volts.

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

MAY 1, 1955

TUBE DIVISION

TENTATIVE DATA

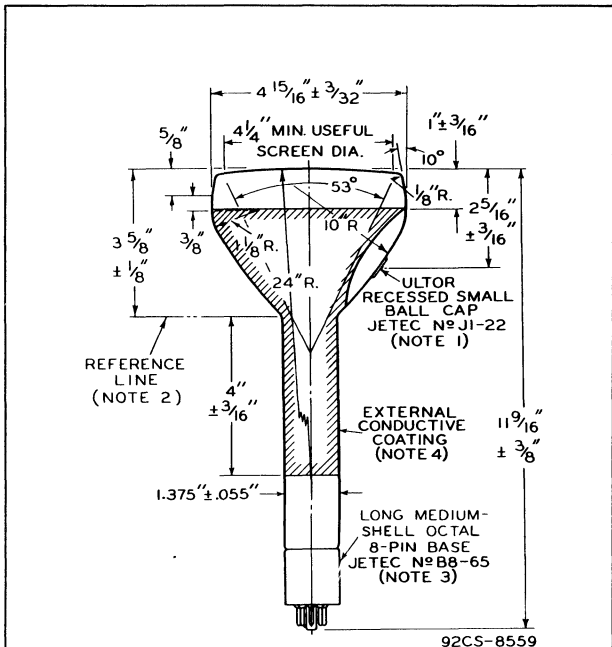
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



5AYP4

5AYP4

VIEW-FINDER KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTRON TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. ULTRON TERMINAL IS ON SAME SIDE OF TUBE AS PIN 5.

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

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

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

MAY 1, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-8559

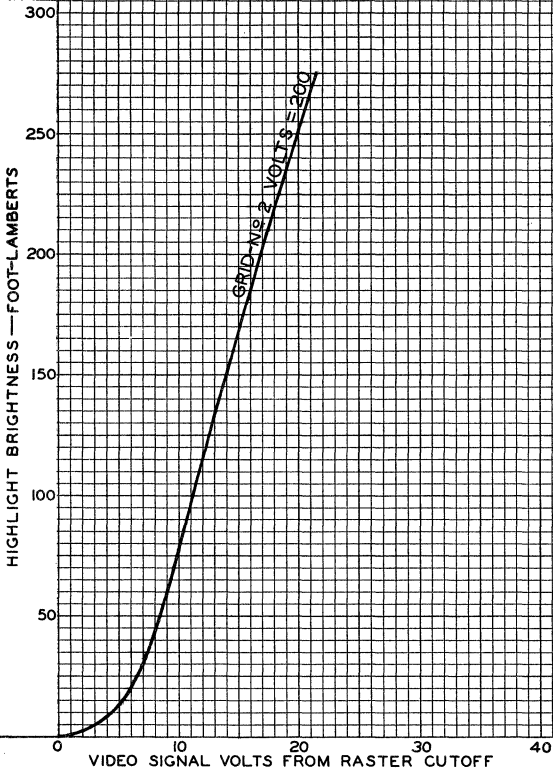
5AYP4



5AYP4

AVERAGE GRID-DRIVE CHARACTERISTIC

$E_f = 6.3$ VOLTS
ULTOR (GRID No 4 AND COLLECTOR) VOLTS = 10000
GRID - No 3 VOLTS ADJUSTED TO GIVE FOCUS AT AVERAGE RASTER BRIGHTNESS
GRID No 1 BIASED TO CUTOFF OF FOCUSED RASTER
RASTER SIZE = $3 \frac{3}{8} \times 2 \frac{1}{2}$ "

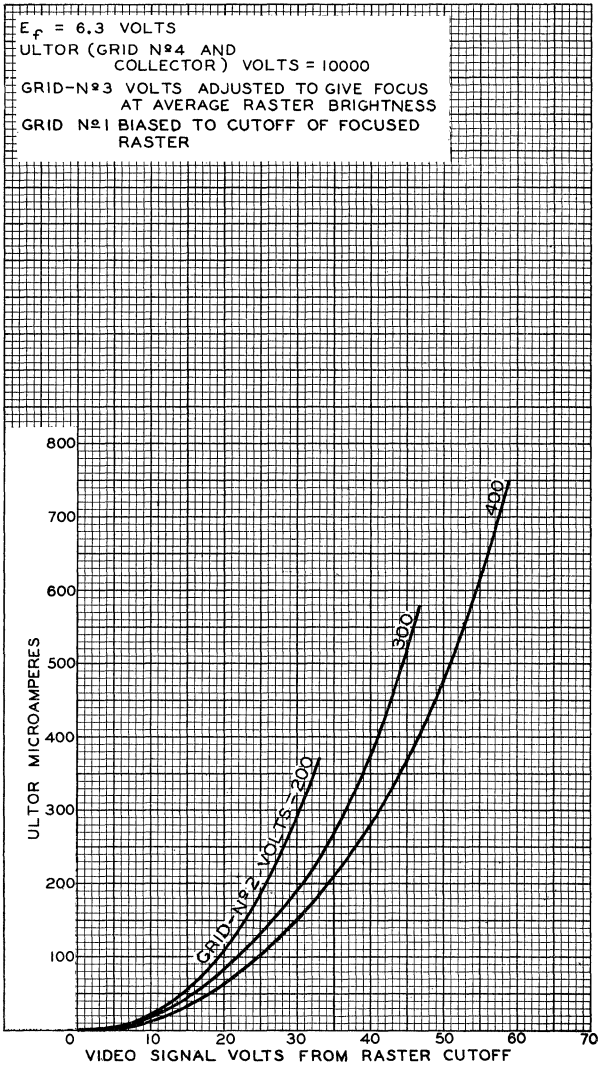




5AYP4

5AYP4

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 24, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

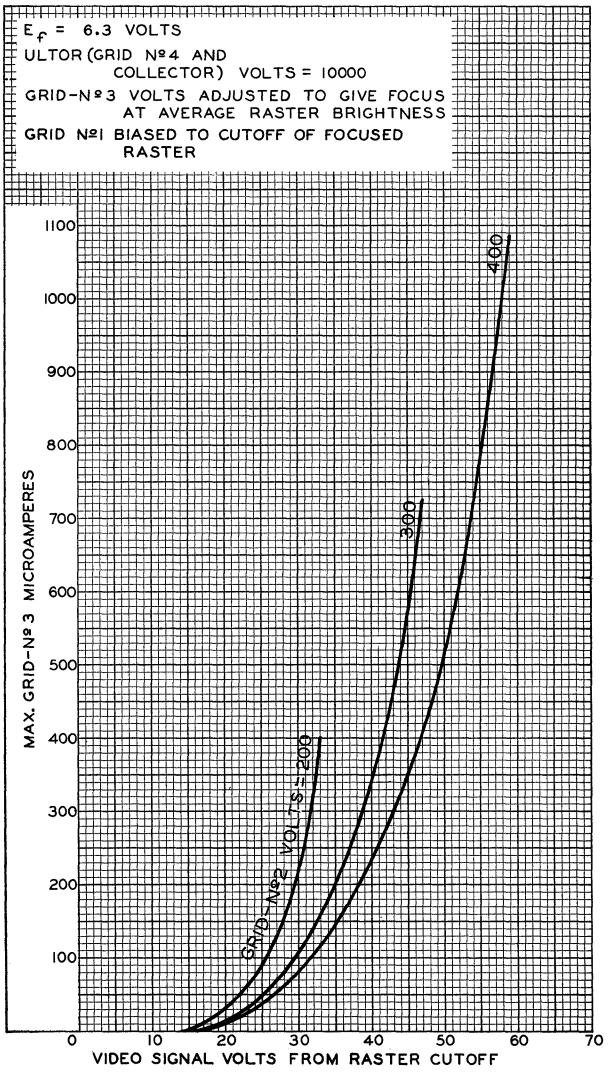
92CM-7688R2

5AYP4



5AYP4

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 24, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM - 7799R1



5AZP4

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. μf
Cathode to all other electrodes 5 μf

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

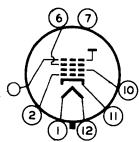
Ultror Lead Molded-On Insulated Cable 48" Long

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
Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater
Flexible Cable - Ultror (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 ultror 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



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 μ amp.	18.5% to 22.5% of E_{C_4}	volts
Grid-No.2 Voltage when cir- cuit 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 μ amp	100	μ amp
Grid-No.2 Current.	-15 to +15	μ amp

Examples of Use of Design Ranges:

For ultor voltage of 36000 volts

Grid-No.3 (Focusing Electrode) Voltage for ultor current of 300 μ amp.	6650 to 8100	volts
Grid-No.2 Voltage when cir- cuit 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.



5AZP4

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.

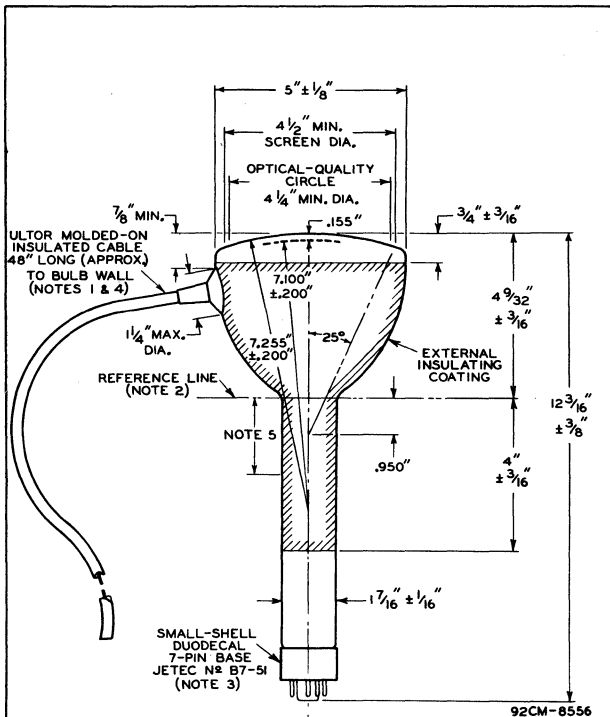
An *air-cooling system* is required to cool the face of the 5AZP4 when the tube is operated with an average ultor input in excess of 9 watts. The system consists of a suitable blower and air duct, having an outlet diameter of about 2 inches, directed perpendicularly onto the face of the tube. The air 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.

5AZP4



5AZP4

PROJECTION KINESCOPE





5AZP4

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 $\pm 20^\circ$. 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.

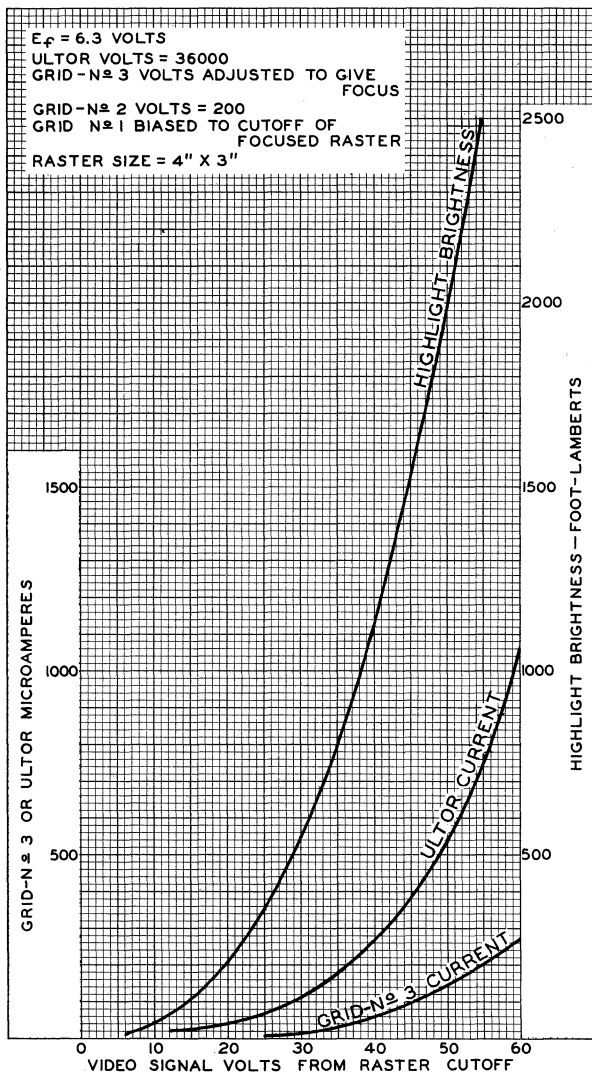
NOTE 5: THE WINDINGS OF THE DEFLECTING YOKE SHOULD NOT EXTEND MORE THAN 2" FROM THE REFERENCE LINE TOWARD THE BASE. THEY SHOULD BE INSULATED TO WITHSTAND 20 KV AND BE SPACED AT LEAST 1/10" FROM THE TUBE NECK.

5AZP4



5AZP4

AVERAGE DRIVE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM - 8549



5BPI-A

5BPI-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	μuf
DJ ₁ to DJ ₂	1.3	μuf
DJ ₃ to DJ ₄	1.2	μuf
DJ ₁ to All Other Electrodes	9.5	μuf
DJ ₃ to All Other Electrodes	12.0	μuf
DJ ₁ to All Other Electrodes except DJ ₂	8.0	μuf
DJ ₂ to All Other Electrodes except DJ ₁	7.5	μuf
DJ ₃ to All Other Electrodes except DJ ₄	10.0	μuf
DJ ₄ to All Other Electrodes except DJ ₃	7.5	μuf

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" - 3/32"

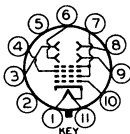
Minimum Useful Screen Diameter 4-1/2"

Mounting Position Any

Base Medium Shell Magnal 11-Pin

Basing Designation for BOTTOM VIEW 11N

- | | |
|--|--|
| Pin 1-Heater | Pin 7-Anode No.2 |
| Pin 2-No Connection | Grid No.2 |
| Pin 3-Deflecting Electrode DJ ₁ | Pin 8-Deflecting Electr. DJ ₂ |
| Pin 4-Anode No.1 | Pin 9-Deflecting Electr. DJ ₃ |
| Pin 5-Internal Con. Do not use | Pin 10-Grid No.1 |
| Pin 6-Deflecting Electrode DJ ₄ | Pin 11-Heater, Cathode |



*DJ₁ and DJ₂ are nearer the screen
 DJ₃ and DJ₄ 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 angle between the trace produced by DJ₃ and DJ₄ and its intersection with the plane through the tube axis and pin 1 does not exceed 10°.

The angle between the trace produced by DJ₃ and DJ₄ and the trace produced by DJ₁ and DJ₂ is 90° ± 3°.

5BP1-A



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 DJ₁ and DJ₂. 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.



5CPI-A

OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

5CPI-A

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 μf

Cathode to All Other Electrodes. 9 μf

DJ₁ to DJ₂ 2 μf

DJ₃ to DJ₄ 2 μf

DJ₁ to All Other Electrodes. 9 μf

DJ₂ to All Other Electrodes. 9 μf

DJ₃ to All Other Electrodes. 7 μf

DJ₄ to All Other Electrodes. 8 μf

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. J1-22)

Base Medium-Shell Diheptal 12-Pin (JETEC No. B12-37)

Basing Designation for BOTTOM VIEW 14J1

Pin 1 - Heater Pin 9 - Anode No.2,

Pin 2 - Cathode Grid No.2

Pin 3 - Grid No.1 Pin 10 - Deflecting

Pin 4 - Internal Con. Do not use Electr. DJ₂

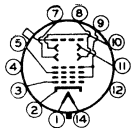
Pin 5 - Anode No.1 Pin 11 - Deflecting

Pin 7 - Deflecting Electrode DJ₃ Electr. DJ₁

Pin 8 - Deflecting Electrode DJ₄ Pin 12 - No Con-

Pin 14 - Heater nection

Cap - Anode No.3



DJ₁ and DJ₂ are nearer the screen

DJ₃ and DJ₄ are nearer the base

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

The plane through the tube axis and each of the following items may vary from the trace produced by DJ₁ and DJ₂ 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 DJ₁ and DJ₂ and the trace produced by DJ₃ and DJ₄ is 90° ± 3°.

5CPI-A



5CPI-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 (E_{b3}) between 2000** and 4000 volts
and any anode-No.2 voltage (E_{b2}) between 1500[▲] and 2000 volts

→ Anode-No.1 Voltage 18.7 to 34.5% of E_{b2} . . . volts

→ Grid-No.1 Voltage[♠] 1.5% to 4.5% of E_{b2} . . . volts

Anode-No.1 Current of any
Operating Condition -15 to +10 . . . μ amp

Deflection Factors:

When $E_{b3} = 2 \times E_{b2}$

DJ1 & DJ2	39 to 53 v dc/in./kv of E_{b2}
DJ3 & DJ4	33 to 45 v dc/in./kv of E_{b2}

When $E_{b3} = E_{b2}$

DJ1 & DJ2	31 to 42 v dc/in./kv of E_{b2}
DJ3 & DJ4	27 to 37 v dc/in./kv of E_{b2}

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:				
DJ1 & DJ2	62 to 84	59 to 80	78 to 106	□
DJ3 & DJ4	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.



5CPI-A

5CPI-A OSCILLOGRAPH TUBE

- * Anode No.2 and grid No.2, which are connected together within tube, are referred to herein as anode No.2.
- At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode-No.2 input power to 6 watts.
- ** It is recommended that anode-No.3 voltage be not less than 3000 volts for high-speed scanning.
- ▲ Recommended minimum value of anode-No.2 voltage.
- ♣ For visual 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.

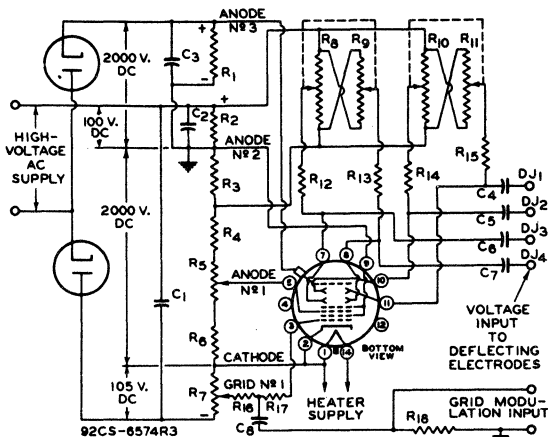
5CPI-A



5CPI-A

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.1 μ f, 2500 Volts
 C2: 1.0 μ f, 200 Volts
 C3: 0.1 μ f, 2500 Volts
 C4 C5 C6 C7: 0.05- μ f,
 Blocking Capacitors*
 C8: 0.0001 μ f, 2500 Volts
 R1: 50 Megohms (Five 10-Meg-
 ohm, 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.

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

OCTOBER 1, 1951

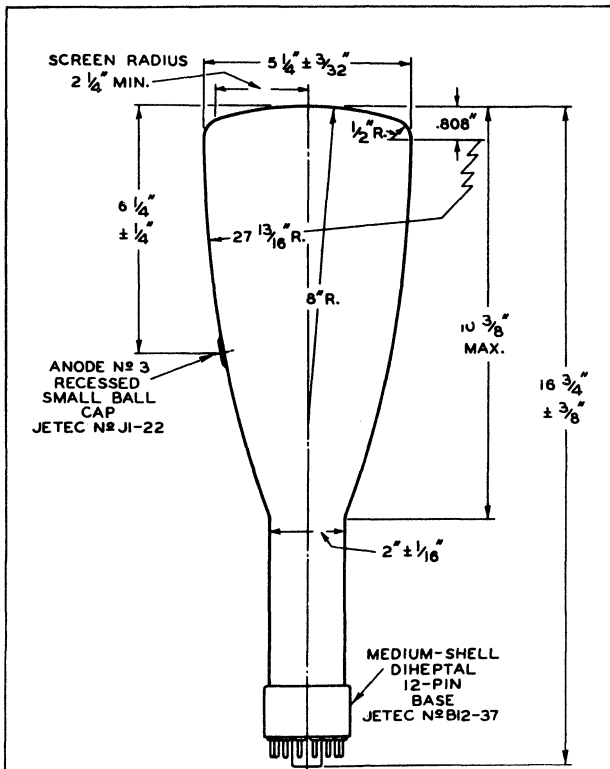
TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-6574R3



5CP1-A

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-640BR4

OCTOBER 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

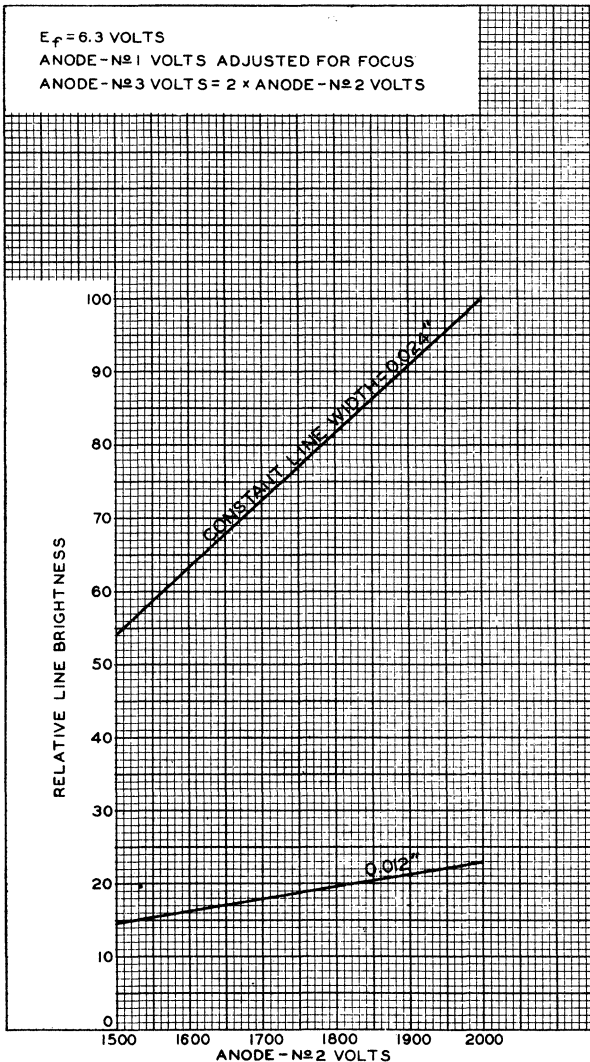
CE-640BR4

5CPI-A



5CPI-A

CHARACTERISTICS

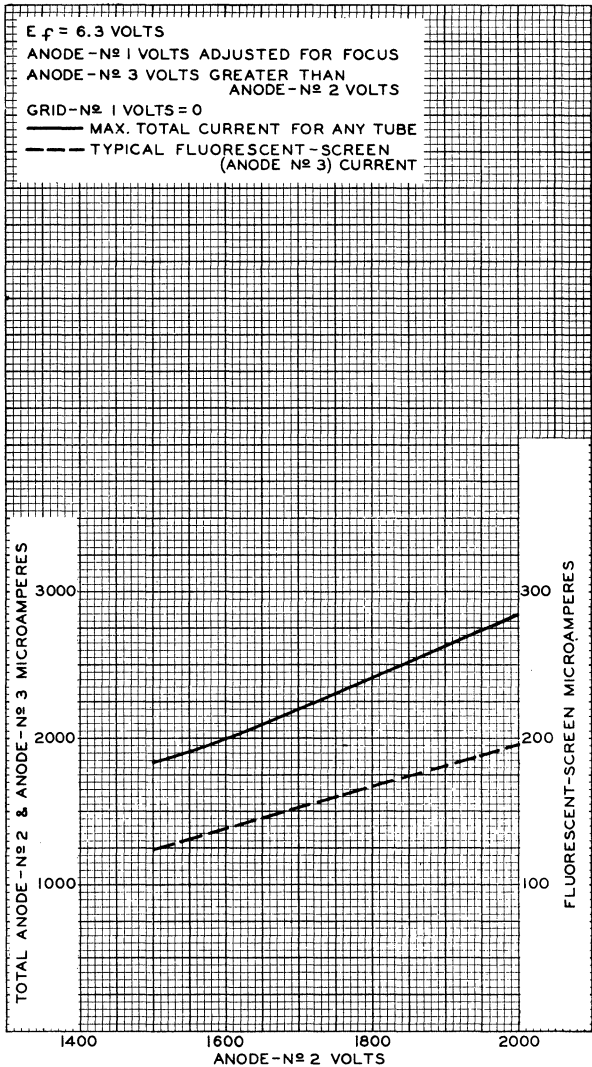




5CPI-A

5CPI-A

CHARACTERISTICS



DEC. 24, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6821

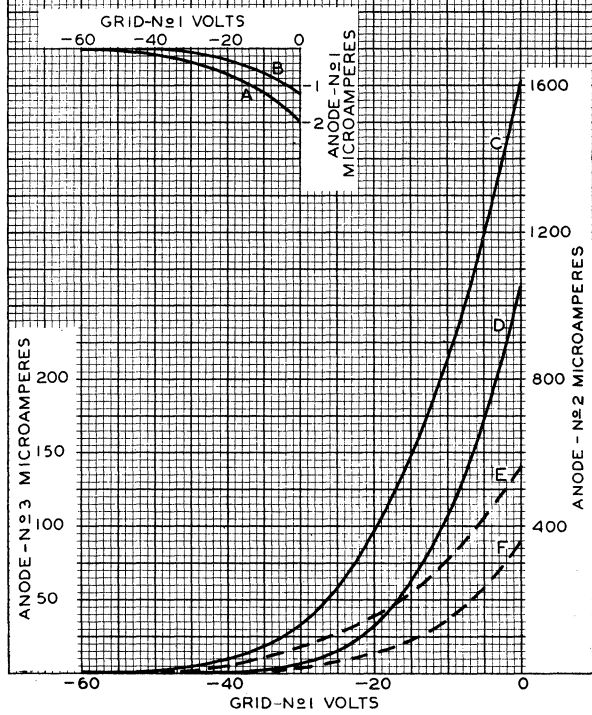
5CPI-A



5CPI-A AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS
ANODE-Nº1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE-Nº2 VOLTS	ANODE-Nº3 VOLTS
A	ANODE Nº 1	2000	2000-4000
B	ANODE Nº 1	1500	1500-3000
C	ANODE Nº 2	2000	4000
D	ANODE Nº 2	1500	3000
E	ANODE Nº 3	2000	4000
F	ANODE Nº 3	1500	3000





5CP7-A OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR
ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

The 5CP7-A is the same as the 5CP1-A, except that it has a screen of the greenish-yellow, long-persistence type, designated P7.

The SPECTRAL-ENERGY EMISSION CHARACTERISTIC, as well as PERSISTENCE CURVES of BUILDUP and DECAY for the P7 PHOSPHOR are shown at the beginning of this Section.



5CP11-A

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

5CP12

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.

(

(

(

(

(

(



5FP7-A

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	μmf
Cathode to All Other Electrodes.	5	μmf

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 $11-1/8" \pm 3/8"$

Greatest Diameter of Bulb. $4-15/16" \pm 3/32"$

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)

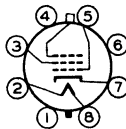
BOTTOM VIEW

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



5FP7-A

OSCILLOGRAPH TUBE

Grid-No.1 Voltage ^o	-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

- ^o For visual extinction of undeflected focused spot.
- # For specimen focusing coil similar to JEDEC Focusing Coil No.106 positioned with air gap toward face plate, and center line of airgap 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.



5FP14-A

5FP14-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	μuf
Cathode to all other electrodes	5	μuf

Faceplate, Spherical Clear Glass
 Phosphor (For curves, see front of this Section) P14
 Fluorescence Purple
 Phosphorescence Orange
 Persistence Medium 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"

Weight (Approx.) 1 lb 2 oz

Mounting Position Any

Cap. Recessed Small Ball (JETEC No. J1-22)

Bulb J39-1/2

Base Medium-Shell Octal 8-Pin (JETEC No. B8-11)

Basing Designation for BOTTOM VIEW 5AN

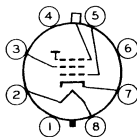
Pin 1 - No Connection

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 input power to 6 watts.

5FPI4-A



5FPI4-A

OSCILLOGRAPH TUBE

Equipment Design Ranges:

With 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
Undelected Focused

Spot	-10% to -28% of E_{C_2}	volts
Grid-No.2 Current	-15 to +15	μ amp
Focusing-Coil Current (DC) ^{oo}	$[\sqrt{E_{C_3}/4000} \times 96] \pm 15\%$	ma
Spot Position	##	

Examples of Use of Design Ranges:

With ultor voltage of	4000	5000	volts
and grid-No.2 voltage of	250	250	volts

Grid-No.1 Voltage for
Visual Extinction of
Undelected Focused

Spot	-25 to -70	-25 to -70	volts
Focusing-Coil Current (DC) .	96 \pm 15%	107 \pm 15%	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 undelected, unfocused, low-intensity spot will fall within a circle having a 9-mm radius concentric with the center of the tube face.

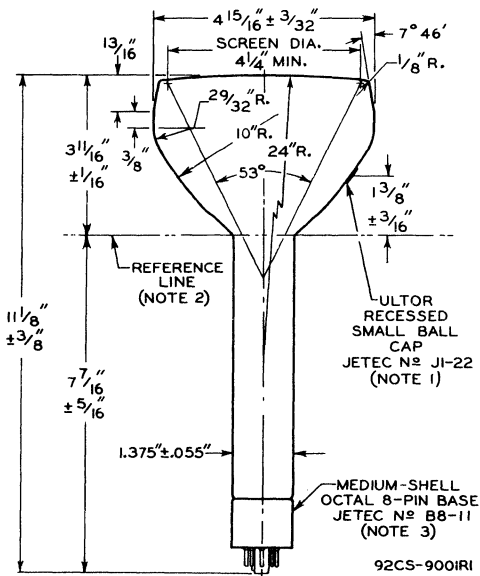
▲ With JETEC Deflecting Yoke No.120, or equivalent, and under the following conditions: heater voltage of 6.3 volts, ultor current of 200 microamperes, grid-No.2 voltage of 250 volts, and a 49-line raster. Raster width is adjusted to 11.4 cm and focusing-coil current is adjusted to give sharpest focus 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 center line of the tube face divided by the number of scanning lines (49).



5FPI4-A

OSCILLOGRAPH TUBE

5FPI4-A



92CS-900IRI

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTROR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. ULTROR 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.

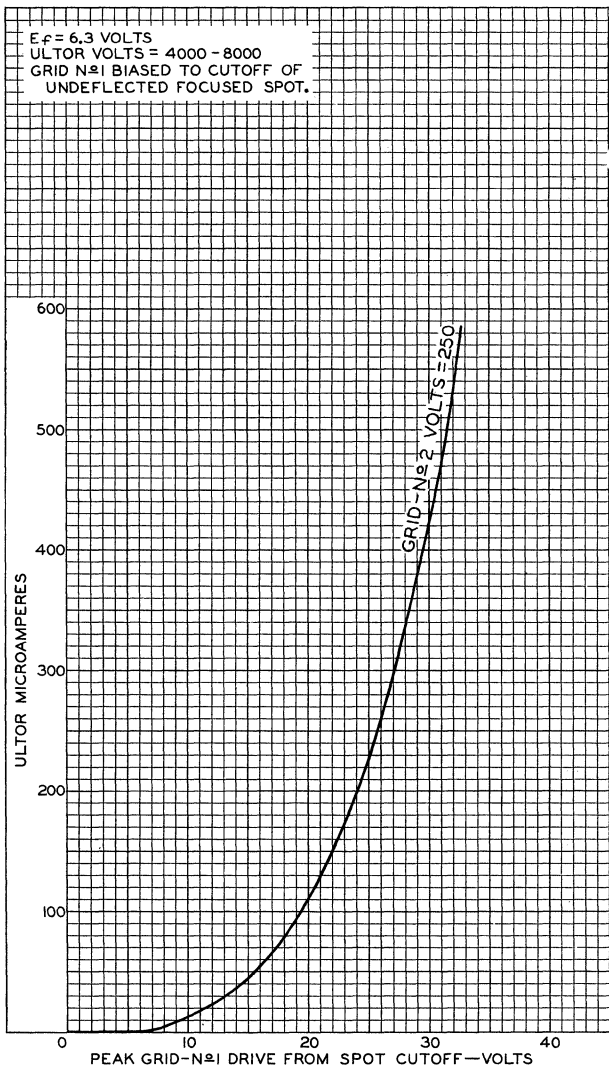
NOTE 3: CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

5FPI4-A



5FPI4-A

AVERAGE GRID-DRIVE CHARACTERISTIC





5FP15-A

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	μf
Cathode to all other electrodes	5	μf

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

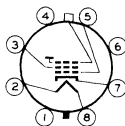
Cap Recessed Small Ball (JETEC No. J1-22)

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



5FP15-A

OSCILLOGRAPH TUBE

Equipment Design Ranges:

For any ultor voltage (E_{c3}) between 4000* and 8000 volts
and grid-No.2 voltage (E_{c2}) between 150 and 700 volts

Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot	-10% to -28% of E_{c2}	volts
Grid-No.2 Current	-15 to +15	μ amp
Focusing-Coil Current (DC) ^{oo} .	$\left[\sqrt{E_{c3}/4000} \times 96 \right] \pm 15\%$	ma
Spot Position	##	

Examples of Use of Design Ranges:

For ultor voltage of	4000	5000	volts
and grid-No.2 voltage of	250	250	volts
Grid-No.1 Voltage for Visual Extinction of Undelected 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.

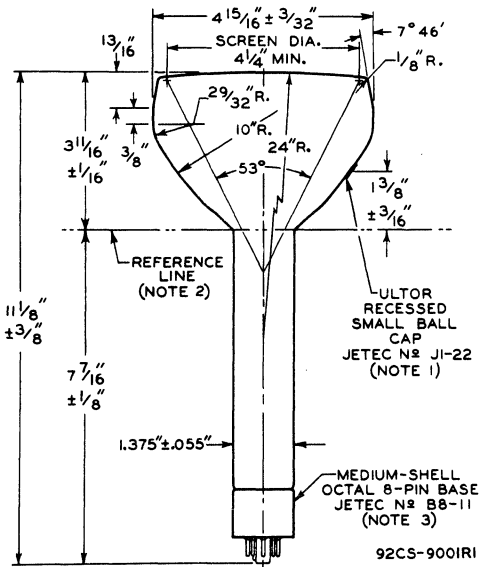
▲ With JETEC Deflecting Yoke No.120, or equivalent, and under the following conditions: heater voltage of 6.3 volts, ultor current of 200 microamperes, grid-No.2 voltage of 250 volts, and a 49-line raster. Raster width is adjusted to 11.4 cm and focusing-coil current is adjusted to give sharpest focus 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).



5FP15-A

OSCILLOGRAPH TUBE

SFP15-A



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTROR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. ULTROR 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.

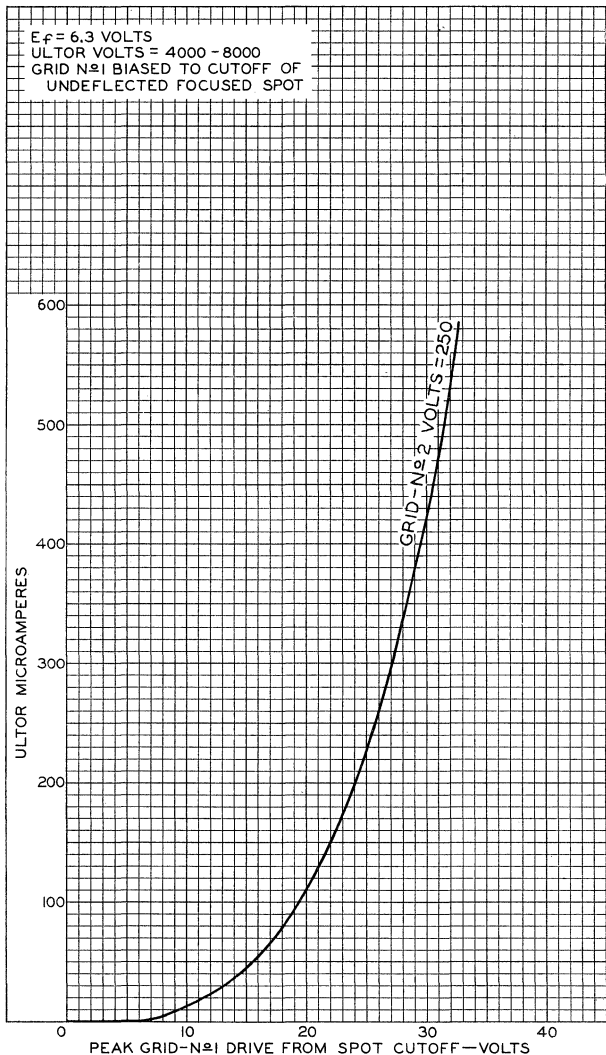
NOTE 3: CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

5FP15-A



5FP15-A

AVERAGE GRID-DRIVE CHARACTERISTIC



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9002



5TP4

5TP4

PROJECTION KINESCOPE

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

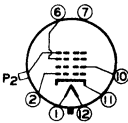
Voltage	6.3	ac or dc volts
Current	0.6	amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes	7.5	$\mu\mu\text{f}$
Cathode to All Other Electrodes	5.0	$\mu\mu\text{f}$
External Conductive Coating to Anode No.2	500 max.	$\mu\mu\text{f}$
	100 min.	$\mu\mu\text{f}$

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" \pm 3/8"
 Greatest Diameter of Bulb 5" \pm 1/8"
 Minimum Useful Screen Diameter 4-1/2"
 Minimum Optical-Quality-Circle Diameter 4-1/4"
 Mounting Position Any
 Base 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. - P₂
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



5TP4

PROJECTION KINESCOPE

Grid-No.2 Voltage**	200	volts
→ Grid-No.1 Voltage for Visual Cutoff ^o	-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

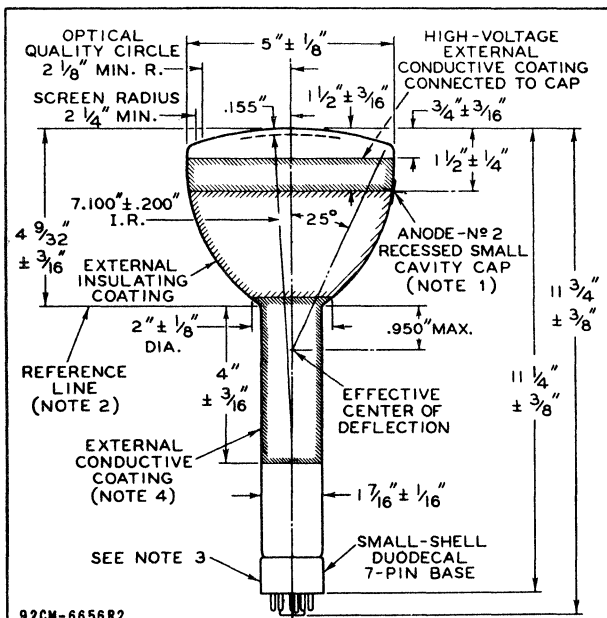
- * Brilliance and definition decrease with decreasing anode voltages. In general, anode No.2 voltage should not be less than 20000 volts.
- ** Subject to variation of ±40% if it is desired to operate any tube at a grid-No.1 cutoff bias of -70 volts.
- o Visual extinction of undeflected focused spot.

→ Indicates a change.



5TP4

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.

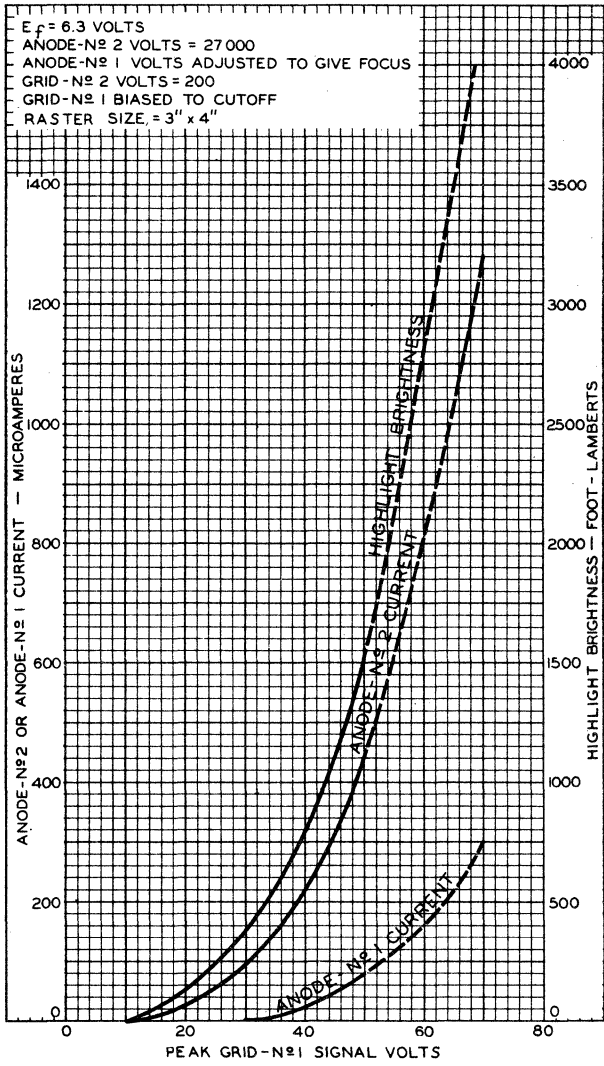
NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

5TP4



5TP4

AVERAGE CHARACTERISTICS





SUPI

SUPI

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

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	μf
DJ1 to DJ2	2.5	μf
DJ3 to DJ4	2.5	μf
DJ1 to All Other Electrodes	11.0	μf
DJ2 to All Other Electrodes	8.0	μf
DJ3 to All Other Electrodes	7.0	μf
DJ4 to All Other Electrodes	8.0	μf

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

Focusing Method Electrostatic

Deflection Method Electrostatic

Overall Length 14-3/4" ± 3/8"

Greatest Diameter of Bulb 5-1/4" ± 3/32"

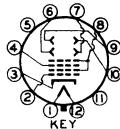
Minimum Useful Screen Diameter 4-1/2"

Mounting Position Any

Base Small-Shell Duodecal 12-Pin

Basing Designation for BOTTOM VIEW 12E

- | | |
|-----------------------------------|------------------------------------|
| Pin 1-Heater | Pin 8-Anode No.2,
Grid No.2 |
| Pin 2-Grid No.1 | Pin 9-Deflecting
Electrode DJ2 |
| Pin 3-Cathode | Pin 10-Deflecting
Electrode DJ1 |
| Pin 4-Anode No.1 | Pin 11-Internal Con.
Do Not Use |
| Pin 5-Internal Con.
Do Not Use | Pin 12-Heater |
| Pin 6-Deflecting
Electrode DJ3 | |
| Pin 7-Deflecting
Electrode DJ4 | |



*DJ₁ and DJ₂ are nearer the screen
 DJ₃ and DJ₄ 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 angle between the trace produced by DJ₁ and DJ₂ and its intersection with the plane through the tube axis and pin 1 does not exceed 10°.

The angle between the trace produced by DJ₃ and DJ₄ and the trace produced by DJ₁ and DJ₂ is 90° ± 30°.

5U1P



5U1P

OSCILLOGRAPH TUBE

Maximum Ratings, Design-Center Values:

ANODE-No.2 [■] VOLTAGE	2500 max.	volts
ANODE-No.1 VOLTAGE	1000 max.	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative bias value.	200 max:	volts
Positive bias value.	0 max.	volts
Peak positive 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_{b2}) between 1000* and 2500 volts

Anode-No.1 Voltage . . .	17% to 32% of E_{b2}	. . . volts
Max. Grid-No.1 Voltage for Visual Cutoff	4.5% of E_{b2}	. . . volts
Anode-No.1 Current for Any Operating Condition	-15 to +10	. . microamp
Deflection Factors:		
DJ ₁ & DJ ₂	28 to 38.5	v dc/in./kv of E_{b2}
DJ ₃ & DJ ₄	23 to 31	v dc/in./kv of E_{b2}

Examples of Use of Design Ranges:

For anode-No.2 voltages of

	<u>1000</u>	<u>2000</u>	volts
Anode-No.1 Voltage . . .	170 - 320	340 - 640	. . volts
Max. Grid-No.1 Voltage for Visual Cutoff	-45	-90	. . volts
Deflection Factors:			
DJ ₁ & DJ ₂	28 - 38.5	56 - 77	volts dc/in.
DJ ₃ & DJ ₄	23 - 31	46 - 62	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

* Recommended minimum value.

□ 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.

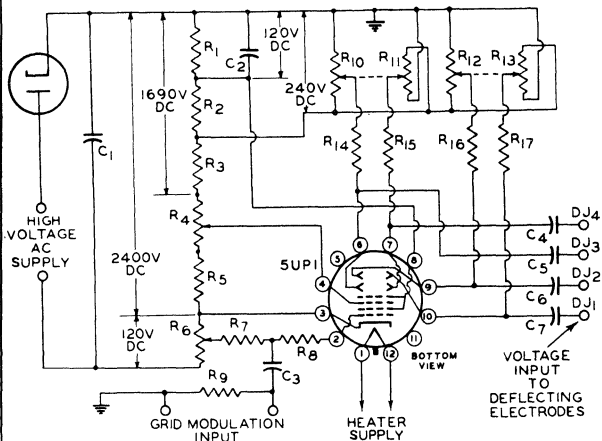


5U1P1

OSCILLOGRAPH TUBE

5U1P1

TYPICAL CIRCUIT



92CM-6819

R1 R2: 2.5 Megohms, 0.5 Watt
 R3: 6 Megohms, 3 Watts
 R4: 2-Megohm Potentiometer
 R5: 1 Megohm, 0.5 Watt
 R6: 0.5-Megohm Potentiometer
 R7: 0.5-Megohm, 0.5 Watt
 R8: Not less than 2000 Ohms per volt of positive signal
 R9: 5-Megohms, 0.5 Watt

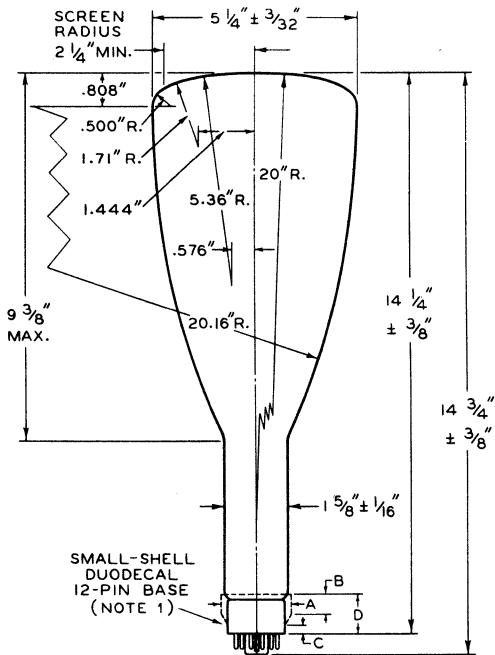
R10-R11, R12-R13: Dual potentiometers, R10, R11, R12, R13: 0.5 Megohm
 R14 R15 R16 R17: 2.2 Megohms, 0.5 Watt
 C1: 0.1 μ f, 2500 Volts
 C2: 1 μ f, 200 Volts
 C3: 0.0001 μ f, 2500 Volts
 C4 C5 C6 C7: 0.1 μ f, 600 Volts

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

5U1



5U1 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.

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

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

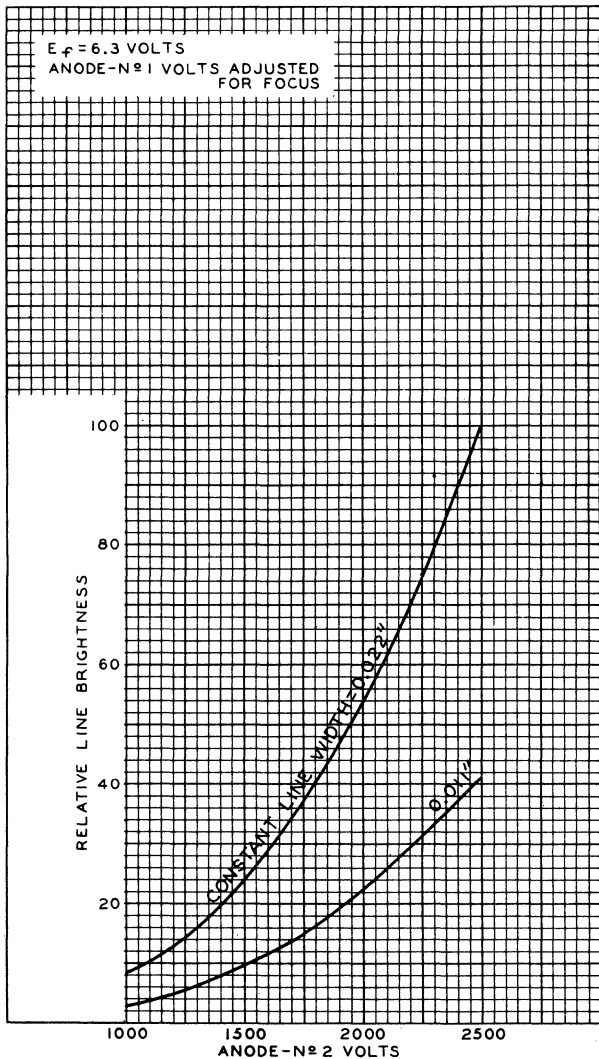
92CM-6763



5U1

5U1

AVERAGE CHARACTERISTICS



NOV. 7, 1946

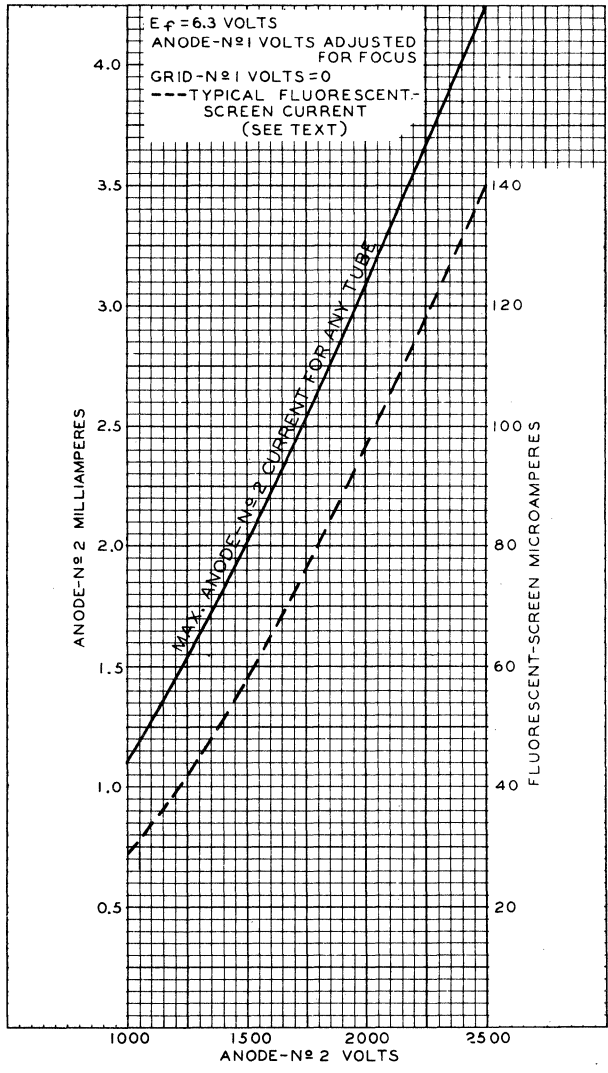
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6808

5U1



CHARACTERISTICS

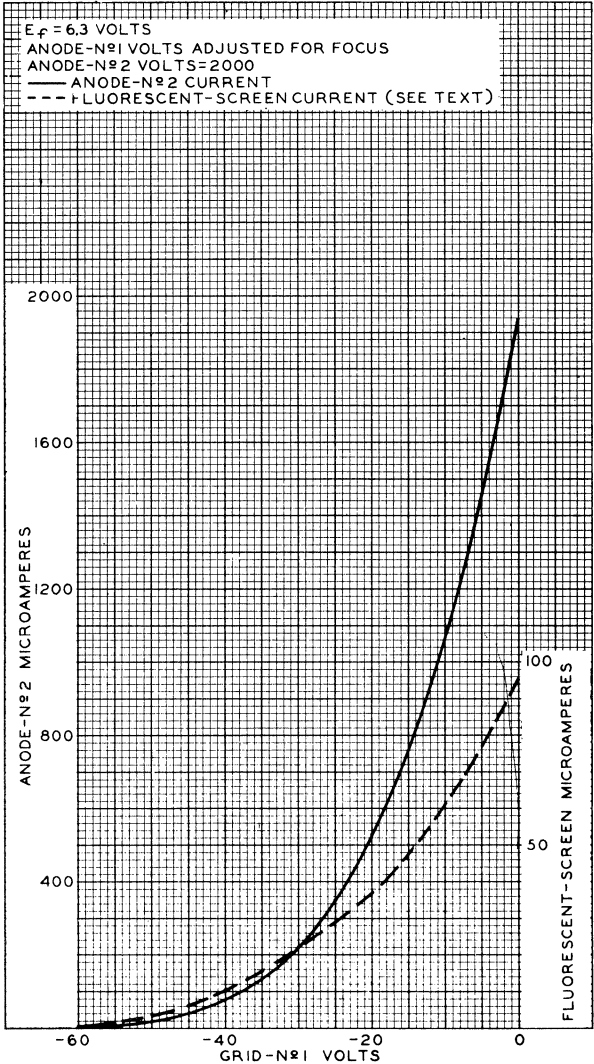




5UPI

5UPI

AVERAGE CHARACTERISTICS



NOV. 11, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6810

() () () () () () () () () ()



5UP7

5UP7

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

The 5UP7 is the same as the 5UP1, except that it has a screen of the greenish-yellow, long-persistence type, designated P7. Persistence of useable brightness can be obtained with an anode-No.2 voltage of as low as 1500 volts.

The SPECTRAL-ENERGY EMISSION CHARACTERISTIC, as well as PERSISTENCE CURVES of BUILDUP and DECAY for the P7 PHOSPHOR are shown at the beginning of this section

○

○

○

○

○

○

○

○

○

○

○

○

○

○

○



5UP11

5UP11

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

The 5UP11 is the same as the 5UP1, 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 5UP11 particularly useful for photographic recording. Because its improved phosphor has exceptional brightness for a blue screen, the 5UP11 is also quite useful for visual observation of phenomena. Radiation of useable intensity can be obtained with anode-No.2 voltages as low as 1500 volts.

The SPECTRAL-ENERGY EMISSION CHARACTERISTIC
of the P11 PHOSPHOR is shown
at the beginning of this section

DEC. 20, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA

1

2

3

4

5

6



5WP11

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 μf

Cathode to All Other Electrodes 5 μf

External Conductive Coating to Anode No.2 $\left\{ \begin{array}{l} 500 \text{ max.} \\ 100 \text{ min.} \end{array} \right. \mu\text{f}$

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 $11-7/16" \pm 3/8"$

Greatest Diameter of Bulb $5" \pm 1/8"$

Minimum Useful Screen Diameter $4-1/4"$

Raster Size (Approx.) $2-1/2" \times 3-3/8"$

Mounting Position Any

Cap. Recessed Small Cavity

Base Small-Shell Duodecal 7-Pin

Basing Designation for BOTTOM VIEW 12C

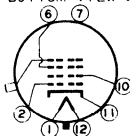
Pin 1-Heater

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.

5WPII



5WPII

TRANSCRIBER KINESCOPE

Anode-No.1 Voltage Range for		
Anode-No.2 Current of 20 μ amp.	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	μ amp
Max. Anode-No.1 Current.	25	μ amp
Grid-No.2 Current Range.	-15 to +15	μ amp

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 $\pm 40\%$ when grid-no.1 voltage cutoff is desired at -70 volts.

OPERATING NOTES

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

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



5WP11

5WP11

TRANSCRIBER KINESCOPE

The screen of the 5WP11 has highly actinic blue radiation, and is particularly effective for photography. The persistence 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.

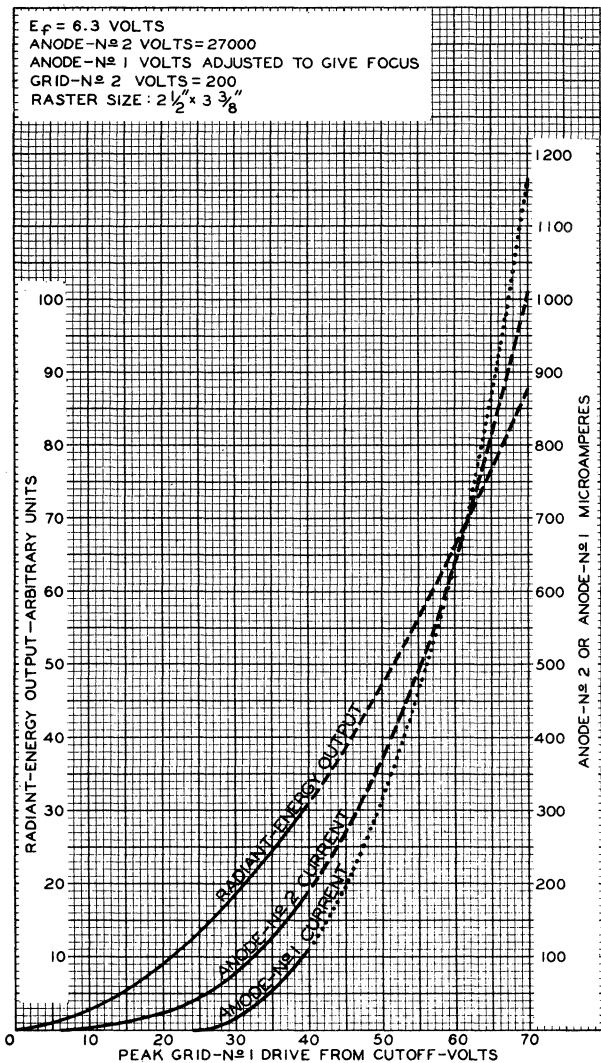
OUTLINE DIMENSIONS for the 5WP11 are the same
as those for the 5WP15

5WP11



5WP11

AVERAGE CHARACTERISTICS



OCTOBER 28, 1948

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7105



5WP15

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 μf
 Cathode to all other electrodes 5 μf
 External conductive neck coating to ultor $\left\{ \begin{array}{l} 500 \text{ max. } \mu\text{f} \\ 100 \text{ min. } \mu\text{f} \end{array} \right.$

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

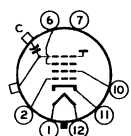
Cap. Recessed Small Cavity (JETEC No. J1-21)

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:

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

← Indicates a change.

5WP15



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_{c4}) between 15000* and 27000 volts

Grid-No.3 Voltage for focus with ultor current of 150 μ a or less.	15% to 19% of E_{c4}	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_{c1}	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_{c2}	volts
Maximum Grid-No.3 Current for ultor current of 150 μ a	200	μ a
Grid-No.2 Current	-15 to +15	μ a

→ 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	μ a

Maximum Circuit Values:

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

* : See next page.

→ Indicates a change.



5WPI5

FLYING-SPOT CATHODE-RAY TUBE

5WPI5

* 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 5WPI5 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 5WPI5 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 5WPI5 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 5WPI5 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.

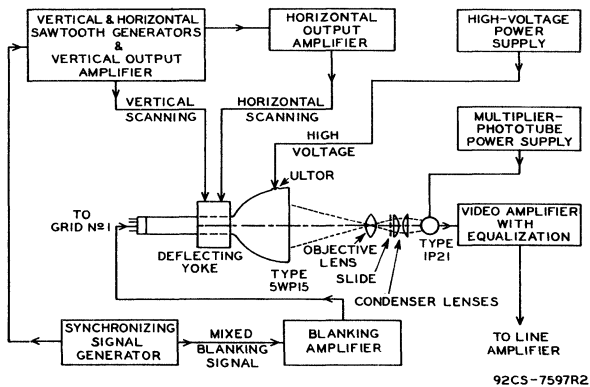


5WP15

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 TRANSPARENTIES



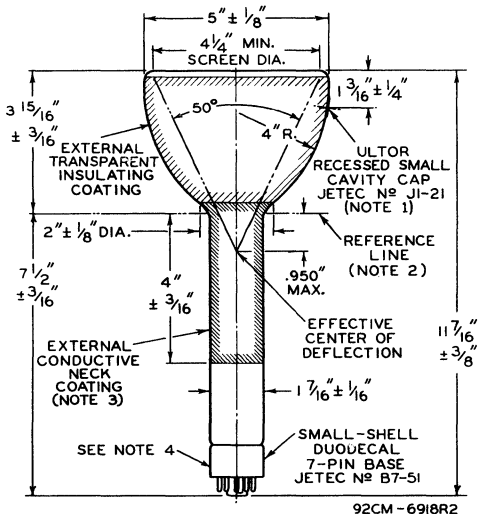
Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.



5WPI5

5WPI5

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 $\pm 10^\circ$. 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.

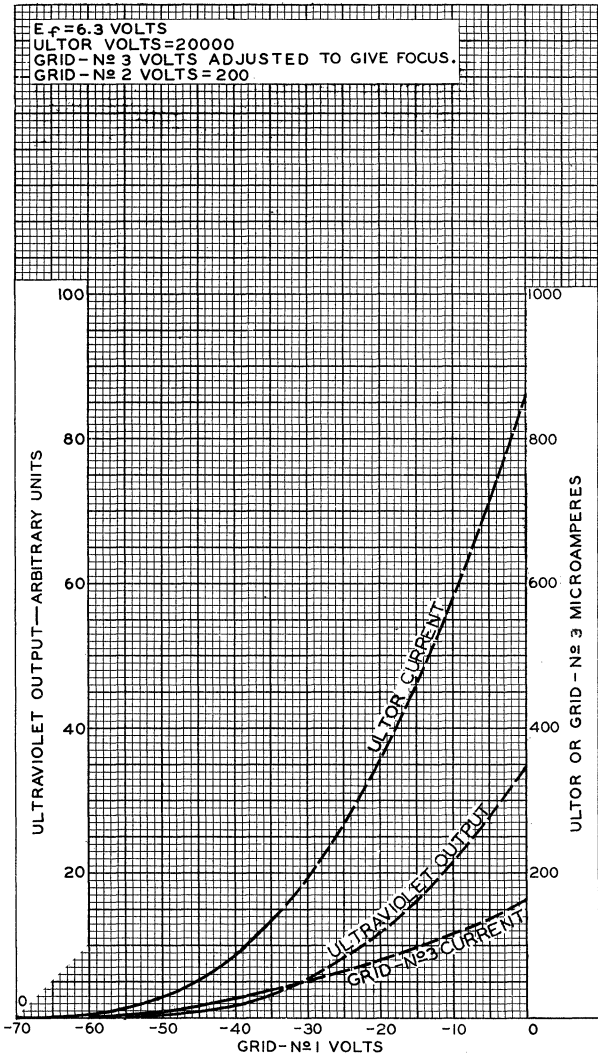
NOTE 4: \angle OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

5WP15



5WP15

AVERAGE CHARACTERISTICS

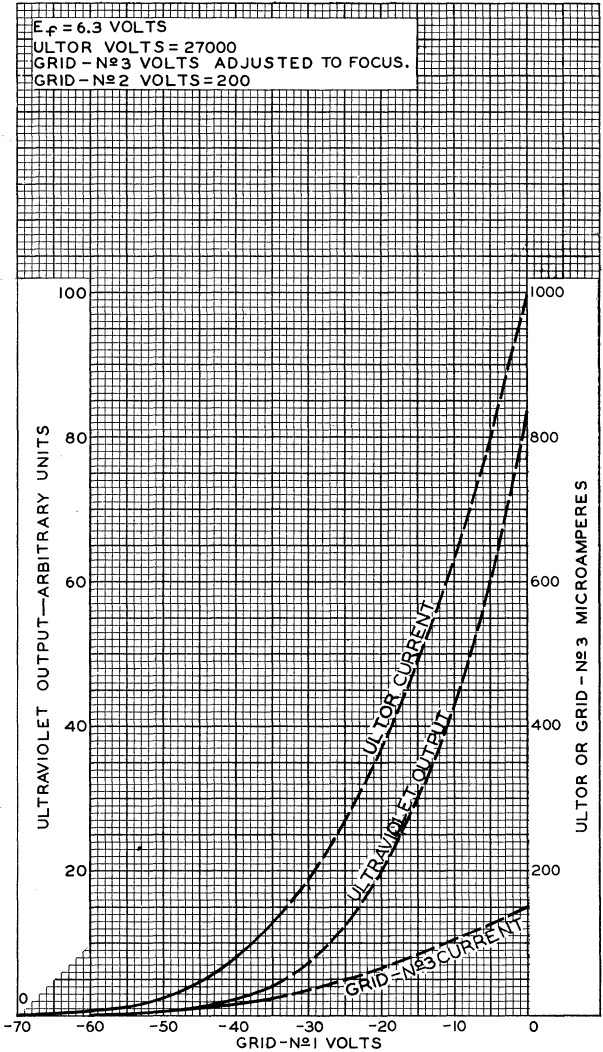




5WP15

AVERAGE CHARACTERISTICS

5WP15







5ZP16

5ZP16

FLYING-SPOT CATHODE-RAY TUBE

HIGH RESOLUTION CAPABILITY
ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
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 μf
Cathode to all other electrodes. 5 μf
External conductive neck coating to ultor. { 500 max. μf
100 min. μf

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 (Approx.) 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

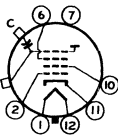
Pin 6—Grid No.3

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 Coat-
ing

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.

5ZP16



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_{C4}) between 20000* and 27000 volts

Grid-No.3 Voltage for focus with ultor current of 25 μ a or less.	20.5% to 26.5% of E_{C4}	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_{C1}	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_{C2}	volts
Grid-No.2 Current.	-15 to +15	μ a

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	μ a

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.



5ZP16

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.

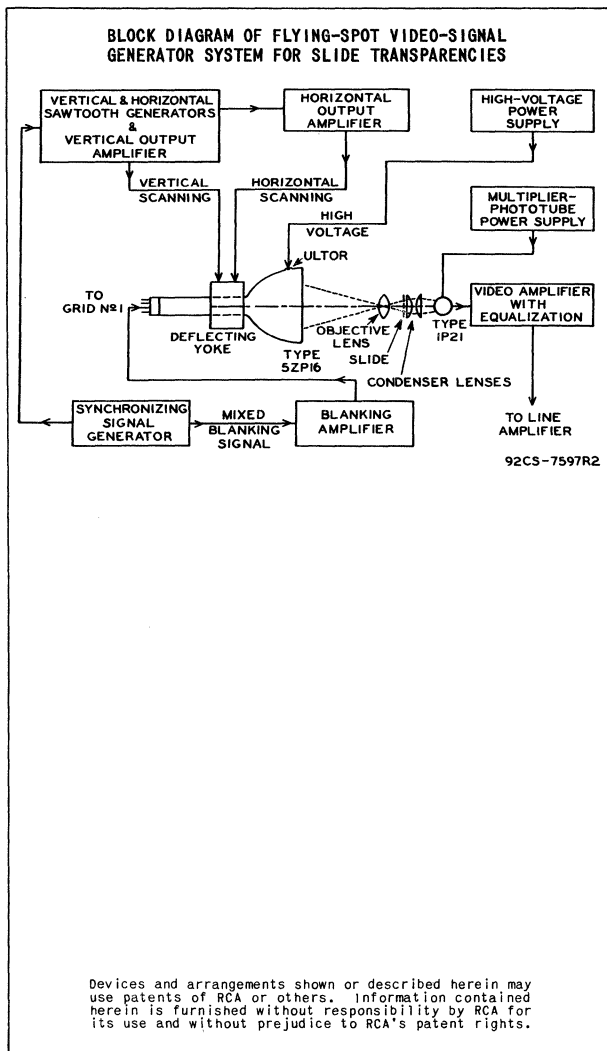
← Indicates a change.

5ZP16



5ZP16

FLYING-SPOT CATHODE-RAY TUBE

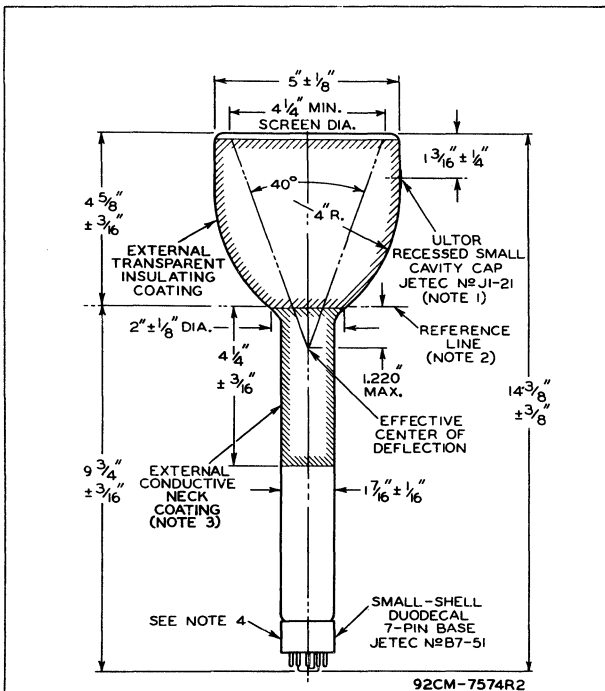




5ZP16

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 $\pm 10^\circ$. 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 GROUNDING.

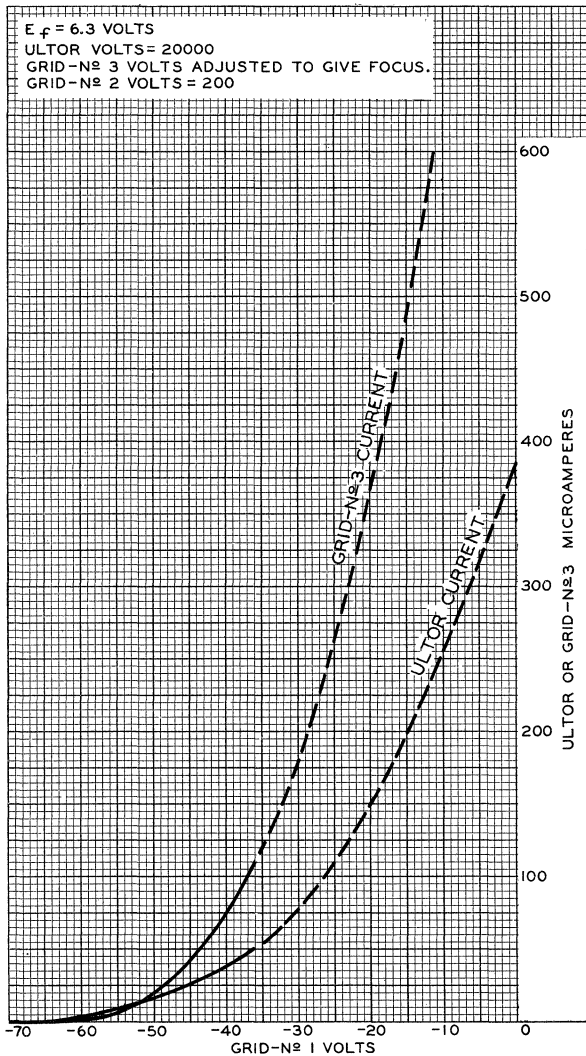
NOTE 4: ϕ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

5ZP16



5ZP16

AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION

92CM-7575RI

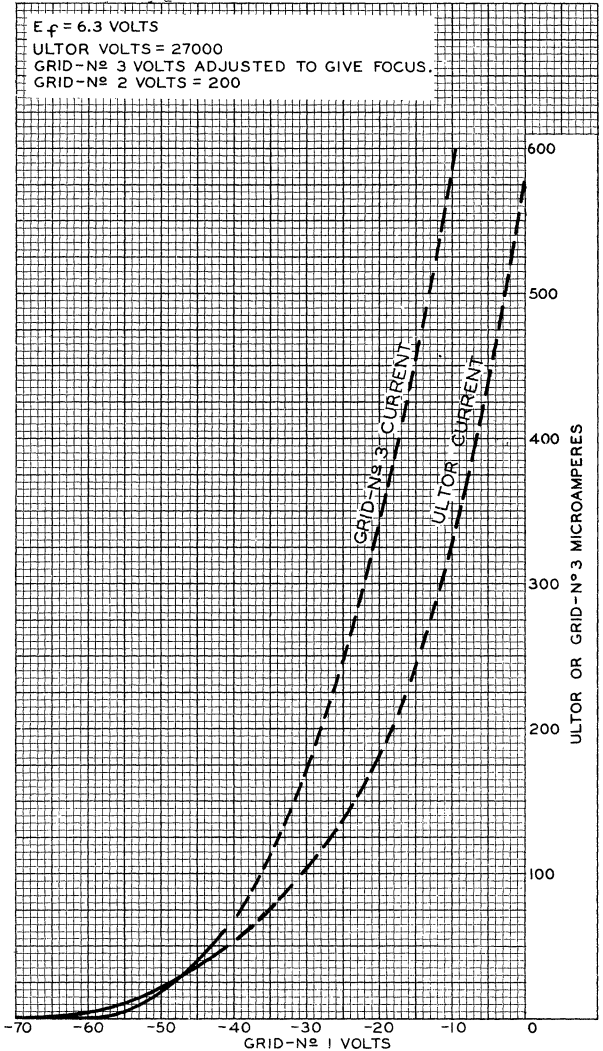
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



5ZP16

5ZP16

AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION

92CM-7576R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY





7BP7-A

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 $\mu\mu\text{f}$

Grid No.2 to All Other Electrodes 7 $\mu\mu\text{f}$

Cathode to All Other Electrodes 5 $\mu\mu\text{f}$

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" \pm 3/8"

Greatest Diameter of Bulb 7" \pm 1/8"

Maximum Useful Screen Diameter 6"

Mounting Position Any

Cap. Recessed Small Ball

Base Long Medium-Shell Octal 8-Pin

BOTTOM VIEW

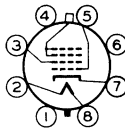
Pin 1 - No Connection

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.

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 2-3/4" from referenceline (see Outline Drawing); and total anode current of 200 microamperes.
- # The center of the undeflected, unfocused spot will fall within a circle having 12 mm radius concentric with the center of the tube face.



7JP4

PICTURE TUBE

ROUND GLASS TYPE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

7JP4

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 Connec-
tion

Pin 5—Grid No.3

Pin 7—Deflecting
Electrode
DJ₃

Pin 8—Deflecting
Electrode
DJ₄

Pin 9—Ultor

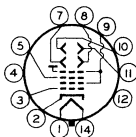
(Grid No.2,
Grid No.4,
Collector)

Pin 10—Deflecting
Electrode
DJ₂

Pin 11—Deflecting
Electrode
DJ₁

Pin 12—Internal
Connection—
Do Not Use

Pin 14—Heater



*DJ₁ and DJ₂ are nearer the screen
DJ₃ and DJ₄ 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.

7JP4



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

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	μf
Cathode to All Other Electrodes	5	μf

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"

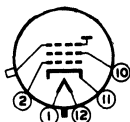
Mounting Position Any

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



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

OCTOBER 1, 1951

TUBE DEPARTMENT

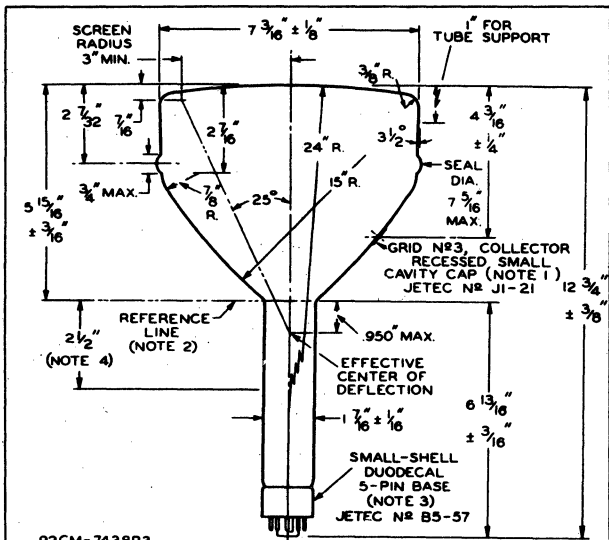
DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



7MP7

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".

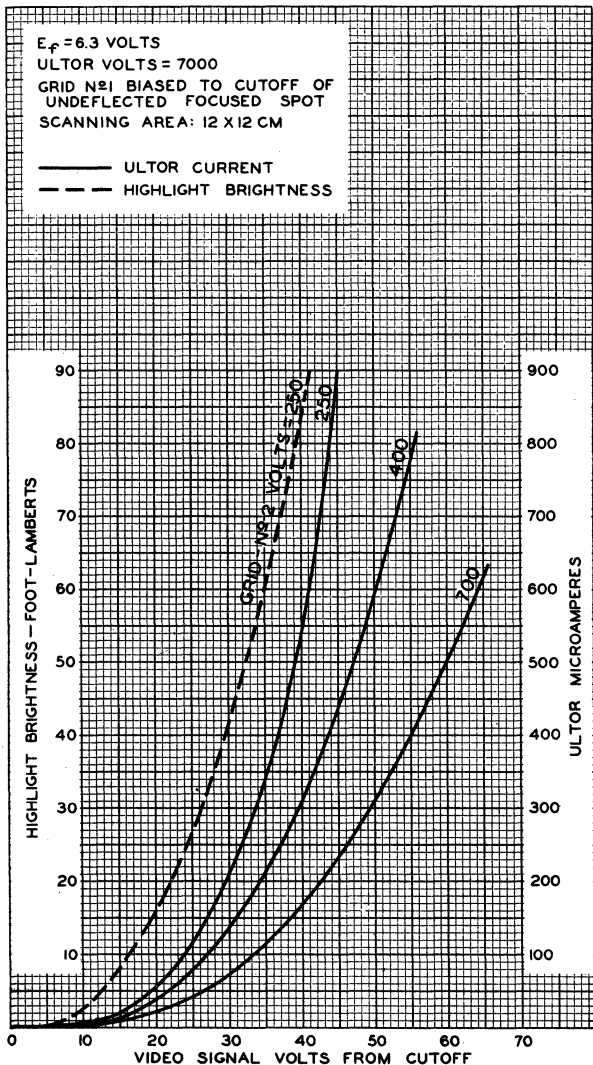
NOTE 4: LOCATION OF DEFLECTING YOKE MUST BE WITHIN THIS SPACE.

7MP7



7MP7

AVERAGE GRID-DRIVE CHARACTERISTICS



JULY 18, 1951

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7450RI



7NP4

7NP4

PROJECTION KINESCOPE

20' x 15' PICTURES

FORCED-AIR COOLED
ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

For use in theater-television equipment

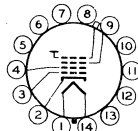
DATA

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 10 - Same as Pin 5 |
| Pin 2 - Cathode | Pin 11 - Same as Pin 5 |
| Pin 3 - Grid No.1 | Pin 12 - Same as Pin 5 |
| Pin 4 - Grid No.2 | Pin 13 - Internal Connection—Do Not Use |
| Pin 5 - No Connection | Pin 14 - Heater Cap-Ultr (Grid No.4, Collector) |
| Pin 6 - Same as Pin 5 | |
| Pin 7 - Same as Pin 5 | |
| Pin 8 - Same as Pin 5 | |
| Pin 9 - Same as Pin 5 | |



← Indicates a change.

7NP4



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_{C4g1}) between 70000* and 80000 volts and grid-No.2-to-grid-No.1 voltage (E_{C2g1}) between 400 and 850 volts

Grid-No.3-to-Grid-No.1

Voltage for focus 20% to 22.6% of E_{C4g1} 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_{kg1}). 3.2 to 4.8 times E_{kg1} 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

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:

<i>For ultor-to-grid-</i>		
<i>No.1 voltage of</i>		
	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 (Ekg 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.

7NP4



7NP4

PROJECTION KINESCOPE

→ Equipment Design Ranges:

With any ultor voltage ($E_{C_{4k}}$) between 7000* and 8000 volts
and grid-No.2 voltage ($E_{C_{2k}}$) between 400 and 600 volts

Grid-No.3 Voltage for focus.	20% to 22.6% of $E_{C_{4k}}$	volts
Grid-No.2 Voltage for visual extinction of focused raster when circuit design utilizes fixed grid- No.1 voltage ($E_{C_{1k}}$). . .	2.58 to 3.87 times $E_{C_{1k}}$	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	μ a
Grid-No.2 Current.	-15 to +15	μ a

→ 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 de- sign utilizes fixed grid- No.1 voltage ($E_{C_{1k}}$) 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

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



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.

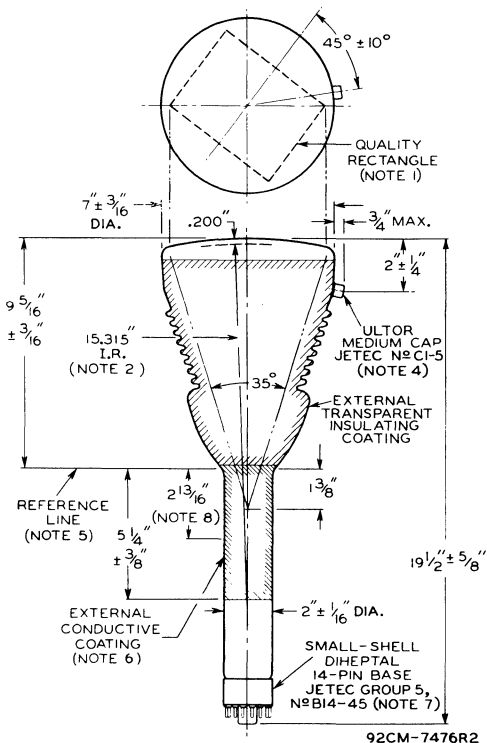
→ Indicates a change.



7NP4

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.

7NP4



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 $\pm 10^\circ$. THE ULTOR TERMINAL IS ON SAME SIDE AS PIN 9.

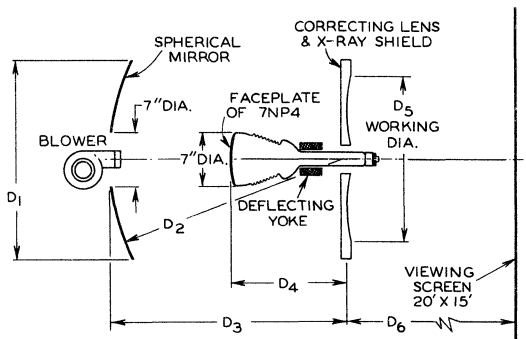
NOTE 5: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 2.100" \pm 0.001" I.D. AND 3" LONG WILL REST ON BULB CONE.

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'

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



7NP4

7NP4

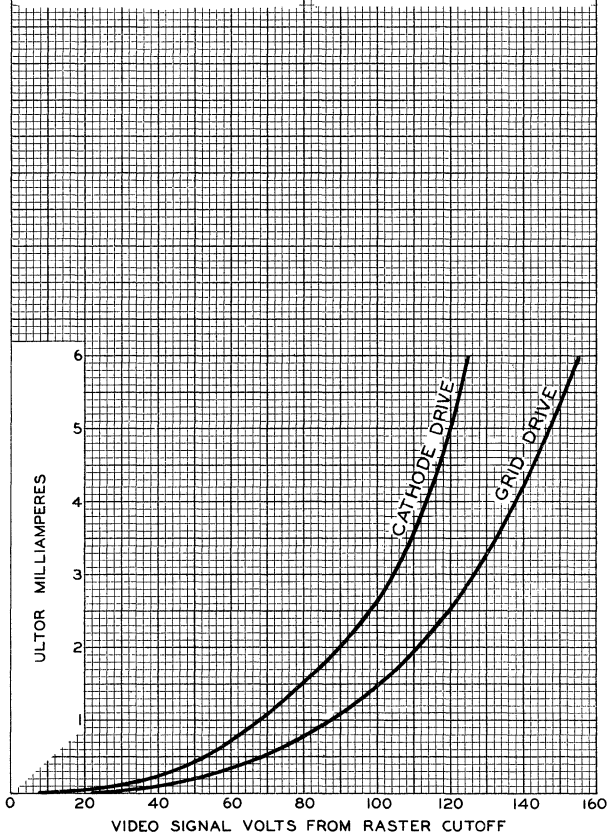
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE

$E_f = 6.6$ VOLTS
ULTOR - TO - GRID - N^o1
VOLTS = 70000 - 80000
GRID - N^o3 - TO - GRID - N^o1 VOLTS
ADJUSTED TO GIVE FOCUS.
GRID - N^o2 - TO - GRID - N^o1 VOLTS
ADJUSTED TO GIVE RASTER
CUTOFF.
CATHODE - TO - GRID - N^o1
VOLTS = 125

GRID-DRIVE SERVICE

$E_f = 6.6$ VOLTS
ULTOR VOLTS = 70000 - 80000
GRID - N^o3 VOLTS ADJUSTED
TO GIVE FOCUS.
GRID - N^o2 VOLTS ADJUSTED
TO GIVE RASTER CUTOFF.
GRID - N^o1 VOLTS = -155



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7514RI

7NP4



7NP4

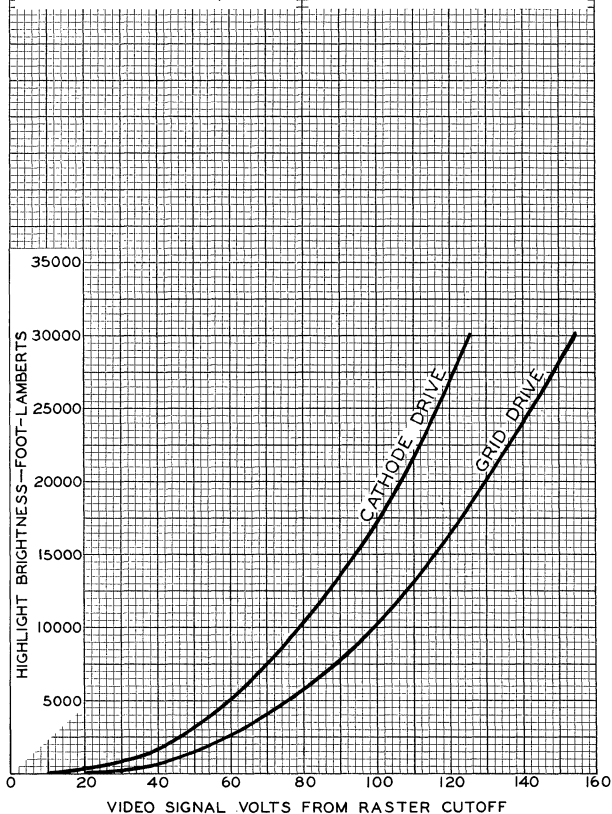
AVERAGE DRIVE CHARACTERISTICS

CATHODE-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 = $5'' \times 3\frac{3}{4}''$

GRID-DRIVE SERVICE

$E_f = 6.6$ 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 = $5'' \times 3\frac{3}{4}''$



ELECTRON TUBE DIVISION

92CM-7515RI

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

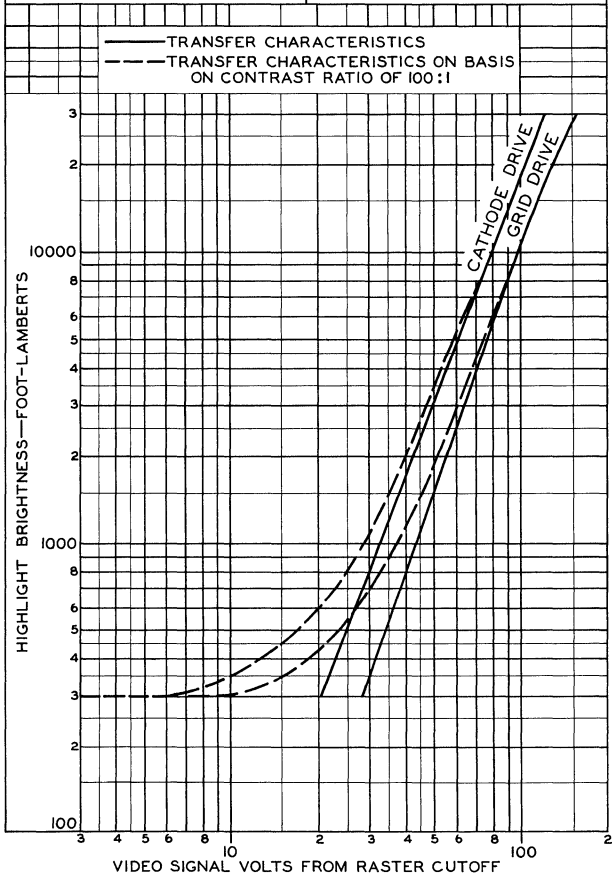


7NP4

7NP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
$E_f = 6.6$ VOLTS	$E_f = 6.6$ VOLTS
ULTOR-TO-GRID- $N_{\#1}$ VOLTS = 75000	ULTOR VOLTS = 75000
GRID- $N_{\#3}$ -TO-GRID- $N_{\#1}$ VOLTS ADJUSTED TO GIVE FOCUS.	GRID- $N_{\#3}$ VOLTS ADJUSTED TO GIVE FOCUS.
GRID- $N_{\#2}$ -TO-GRID- $N_{\#1}$ VOLTS ADJUSTED TO GIVE RASTER CUTOFF.	GRID- $N_{\#2}$ VOLTS ADJUSTED TO GIVE RASTER CUTOFF.
CATHODE-TO-GRID- $N_{\#1}$ VOLTS = 125	GRID- $N_{\#1}$ VOLTS = -155
RASTER SIZE = 5" x 3 3/4"	RASTER SIZE = 5" x 3 3/4"



ELECTRON TUBE DIVISION

92CM-7519R2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

①

②

③

④

⑤

⑥



7TP4

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	$\mu\mu\text{f}$
Cathode to All Other Electrodes	5	$\mu\mu\text{f}$

Faceplate Clear Glass

Phosphor, Metal-Backed^o 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"

Minimum Useful Screen Diameter. 6"

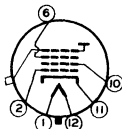
Picture Size (Within minimum-useful-screen area) 5-3/8" x 4"

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
(Ultror)

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

^o 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_{C2}) between 150 and 410 volts

Grid-No.3 Voltage for Focus with Ultor Current of 100 μ amp. . .	11.6% to 15.8% of E_u	volts
Grid-No.1 Voltage for Visual Extinction of Undelected Focused Spot.	11% to 25.7% of E_{C2}	volts
Grid-No.3 Current**.	See Curves	
Grid-No.2 Current.	-15 to +15	μ amp
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 μ amp. . .	1160 to 1580	volts
Grid-No.1 Voltage for Visual Extinction of Undelected 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.

FEB. 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

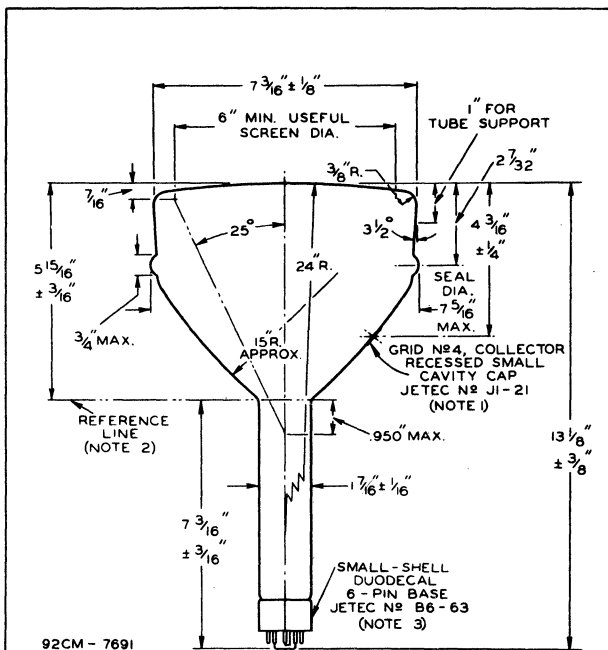
TENTATIVE DATA



7TP4

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 $\pm 10^\circ$. 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 $1\frac{7}{8}$ ".

FEB. 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7691

7TP4



7TP4

AVERAGE GRID-DRIVE CHARACTERISTICS

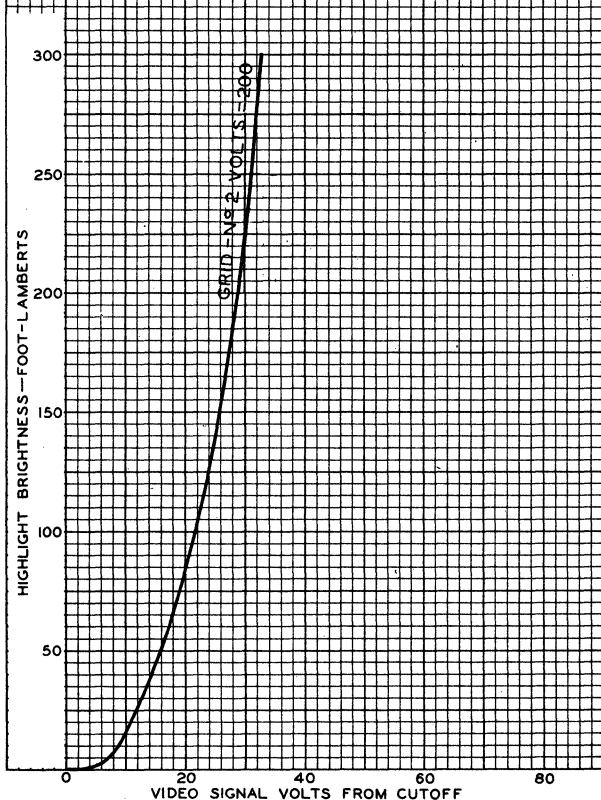
$E_f = 6.3$ VOLTS

ULTOR (GRID-N^o 4 AND COLLECTOR) VOLTS = 10000

GRID-N^o 3 VOLTS ADJUSTED TO GIVE FOCUS AT AVERAGE RASTER BRIGHTNESS

GRID N^o 1 BIASED TO CUTOFF OF UNDEFLECTED FOCUSED SPOT

RASTER SIZE = $5 \frac{3}{8}$ " X 4"



OCT. 3, 1951

TUBE DEPARTMENT
RADC CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7687



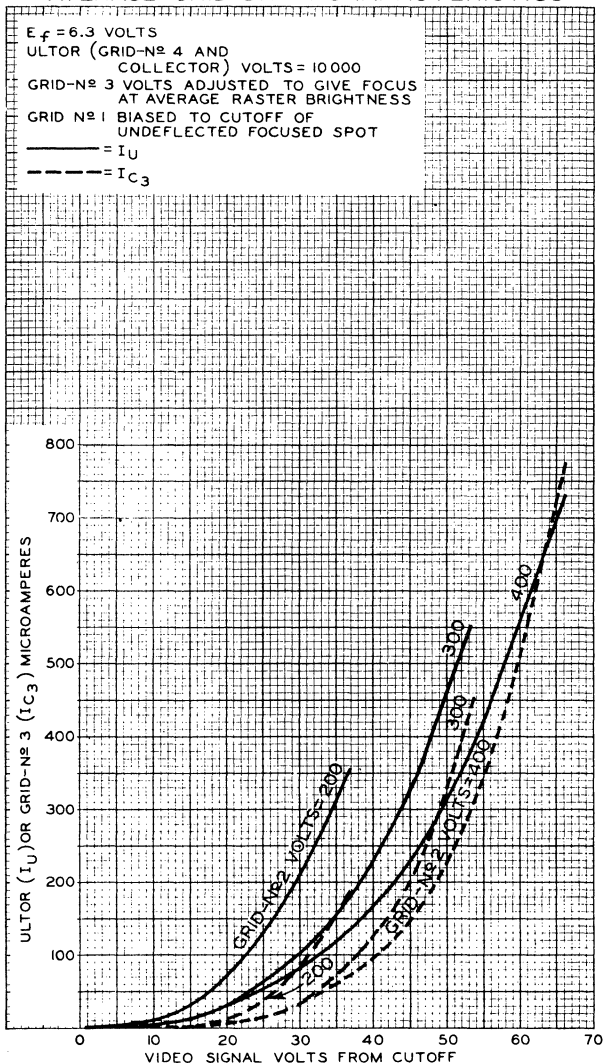
7TP4

7TP4

AVERAGE GRID-DRIVE CHARACTERISTICS

$E_f = 6.3$ VOLTS
ULTOR (GRID-N^o 4 AND COLLECTOR) VOLTS = 10000
GRID-N^o 3 VOLTS ADJUSTED TO GIVE FOCUS AT AVERAGE RASTER BRIGHTNESS
GRID N^o 1 BIASED TO CUTOFF OF UNDEFLECTED FOCUSED SPOT

— = I_U
- - - = I_{C_3}



OCT. 3, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7688



7VPI

7VPI

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6	amp

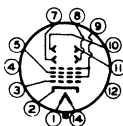
Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes	6	μf
DJ ₁ to DJ ₂	3	μf
DJ ₃ to DJ ₄	2	μf
DJ ₁ to All Other Electrodes	9	μf
DJ ₂ to All Other Electrodes	9	μf
DJ ₃ to All Other Electrodes	7	μf
DJ ₄ to All Other Electrodes	7	μf

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" \pm 3/8"
Greatest Diameter of Bulb	7" \pm 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 DJ₃
- Pin 8 - Deflecting Electrode DJ₄



- Pin 9 - Ultor* (Grid No.2, Grid No.4, Collector)
- Pin 10 - Deflecting Elect. DJ₂
- Pin 11 - Deflecting Elect. DJ₁
- Pin 12 - Internal Connection - Do Not Use
- Pin 14 - Heater

*DJ₁ and DJ₂ are nearer the screen
 DJ₃ and DJ₄ are nearer the base*

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

The plane through the tube axis and pin 5 may vary from the trace produced by DJ₁ and DJ₂ by an angular tolerance (measured about the tube axis) of $\pm 10^\circ$. Angle between DJ₁-DJ₂ trace and DJ₃-DJ₄ trace is $90^\circ \pm 3^\circ$.

*: See next page.

TVPI



7VPI

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	μ amp
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 Volt- age for Visual Extinc- tion 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 ^o	5.0 max.	megohms

* In the 7VPI, 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.

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

#, ##, ^o: See next page.

NOV. 1, 1952

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



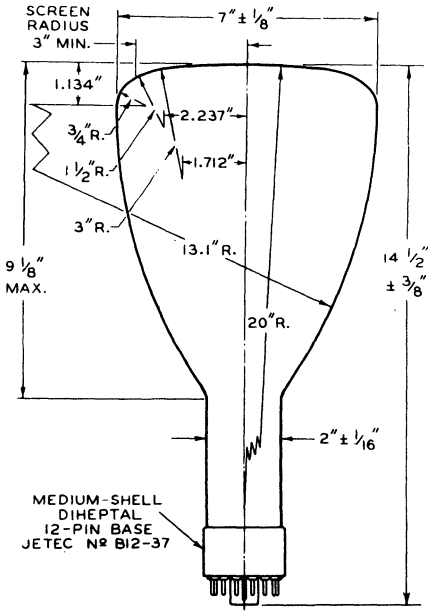
7VP1

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.
- o 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-6667RI

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

7VPI

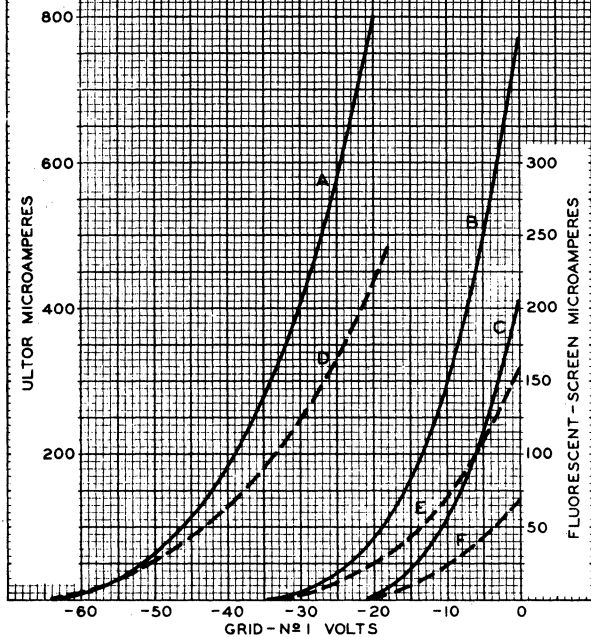


7VPI

AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS
 GRID-N $\#$ 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



DEC. 17, 1951

TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISQN, NEW JERSEY

92CM-7721



7WP4

7WP4

PROJECTION KINESCOPE

20' x 15' PICTURES

FORCED-AIR COOLED
ELECTROSTATIC FOCUS

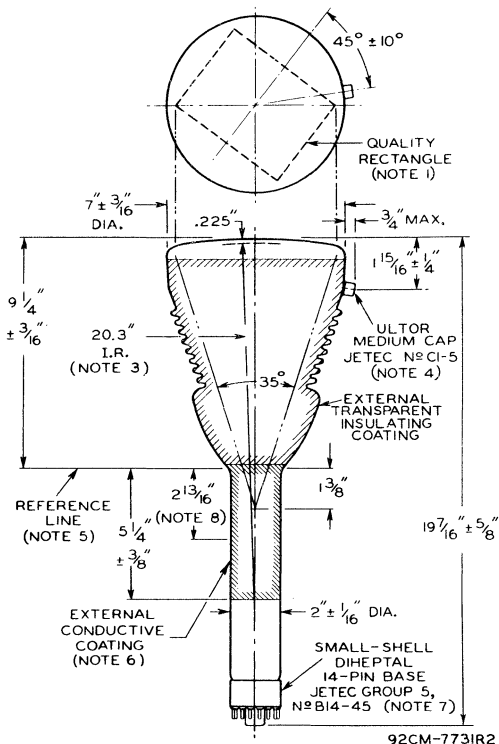
ALUMINIZED SCREEN
MAGNETIC DEFLECTION

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"



7WP4



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.

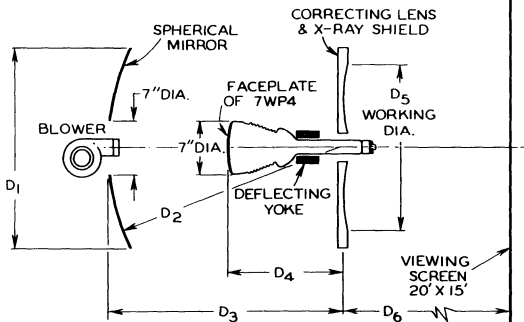


7WP4

PROJECTION KINESCOPE

7WP4

TYPICAL REFLECTIVE OPTICAL SYSTEM



92CS-9769

DIMENSIONS (APPROX.)

D ₁	27" Diameter
D ₂	40" Radius
D ₃	40"
D ₄	20"
D ₅	24.5"
D ₆	80'

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

①

②

③

④

⑤

⑥



8DP4

PICTURE TUBE

SMALL, COMPACT, RECTANGULAR GLASS TYPE

LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

8DP4

DATA

General:

Heater, for Unipotential Cathode:
 Voltage 6.3 ac or dc volts
 Current $0.6 \pm 10\%$ amp
 Capacitance between External Conductive Coating and Ultor $\begin{cases} 350 \text{ max.} & \mu\text{f} \\ 250 \text{ min.} & \mu\text{f} \end{cases}$
 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 $10-7/16" \pm 5/16"$
 Greatest width $7-7/8" + 1/16" - 1/32"$
 Greatest height $6-1/16" + 1/16" - 1/32"$
 Diagonal $8-7/16" + 1/16" - 1/32"$
 Neck length $6-1/2" \pm 3/16"$
 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.

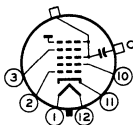
Operating Position Any

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



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
--	----------	---------



8HP4

MONITOR KINESCOPE

8HP4

SMALL, COMPACT, RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

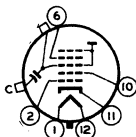
ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes . .	9	μf
Cathode to all other electrodes . . .	5	μf
External conductive coating to ultor.	{350 max.	μf
	{250 min.	μf
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		80%
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	9-15/16" ± 5/16"	
Greatest width	7-7/8" + 1/16" - 1/32"	
Greatest height	6-1/16" + 1/16" - 1/32"	
Diagonal	8-7/16" + 1/16" - 1/32"	
Neck length	6" ± 3/16"	
Screen Dimensions (Minimum):		
Greatest width	7-3/16"	
Greatest height	5-3/8"	
Diagonal	7-13/16"	
Projected area	35.5 sq. in.	
Weight (Approx.)	2-1/2 lbs	
Operating Position		Any
Cap	Recessed Small Cavity (JEDEC No. J1-21)	
Bulb		J67-1/2
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



8HP4

MONITOR KINESCOPE

Maximum Ratings, Absolute-Maximum Values:

ULTOR 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
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_{c5k}) between 8000 and 14000 volts and grid-No.2 voltage (E_{c2k}) between 150 and 500 volts*

Grid-No.4 Voltage required for focus:*

Changes inversely with ultor current at the rate of approximately 80 volts for each 100- μ a change in ultor current.

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

Grid-No.1 Voltage (E_{c1k}) for visual extinction of

focused raster. See *Raster-Cutoff-Range Chart*

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 positive voltage.

Grid-No.4 Current -25 to +25 μ a

Grid-No.2 Current -15 to +15 μ a

Examples of Use of Design Ranges:

With ultor voltage of 11000 volts and grid-No.2 voltage of 300 volts

Grid-No.4 Voltage for focus with average ultor current of 100 μ a 0 to 300 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

(Peak positive) 28 to 72 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 8000 volts.



8HP4

8HP4

MONITOR KINESCOPE

- * The grid-No.4 voltage required for focus of any individual tube will remain essentially constant for values of ultor voltage or grid-No.2 voltage within design ranges shown for these items.
- ▲ Resolution for a given value of ultor voltage and a given value of grid-No.2 voltage decreases with increase in ultor current.
- The indicated voltage is for condition with combined grid-No.1 bias voltage and video-signal voltage (generated by RCA-2F21 monoscope) adjusted to produce the average value of ultor current shown and to provide optimum focus of the Indian-Head Test Pattern from the 2F21.

SPECIAL PERFORMANCE DATA

Resolution: ▲

For ultor voltage of 11,000 volts. . . 600 min. ■ TV lines

- Under the following conditions: heater volts = 6.3, grid-No.2 volts = 300, combined grid-No.1 bias voltage and video-signal voltage (generated by RCA-2F21 monoscope) adjusted to produce an average ultor current of 100 microamperes, and grid-No.4 voltage adjusted to give sharpest focus at center of tube face. Resolution is measured on the RCA-2F21 monoscope test pattern, or equivalent.

OPERATING CONSIDERATIONS

When operated at or below the maximum ratings shown in the tabulated data, *the 8HP4 does not produce any harmful X-ray radiation.*

The high voltages at which the 8HP4 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. Before any part of the circuit is touched, the power-supply switch should be turned off and both terminals of any capacitors should be grounded.

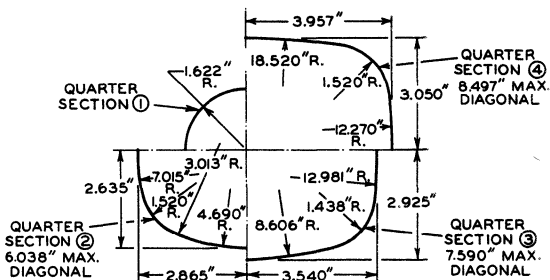
8HP4



8HP4

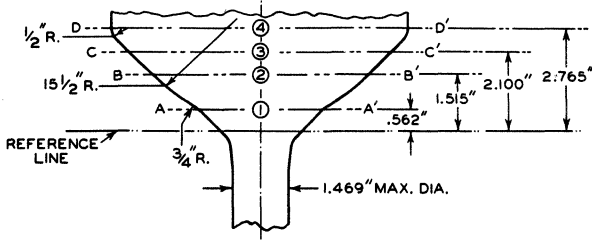
MONITOR KINESCOPE

BULB-CONTOUR DIMENSIONS



TOP VIEW SHOWING MAXIMUM QUARTER-SECTION CONTOURS DEFINED BY PLANES AA', BB', CC', and DD'.

LONG-SIDE VIEW



CONTOURS (1), (2), (3), AND (4) DEFINE MAXIMUM BULB DIMENSIONS IN THE PLANES AA', BB', CC', AND DD'. THE PLANES ARE NORMAL TO THE TUBE AXIS AND AT FIXED LOCATIONS FROM THE REFERENCE LINE. WHEN DIMENSIONED FROM THE FACEPLATE, THE AXIAL POSITIONS OF PLANES AA', BB', CC', AND DD' WILL VARY BY $\pm 0.125''$.



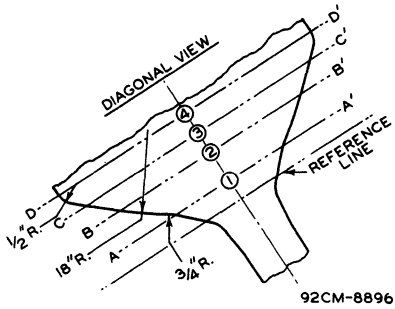
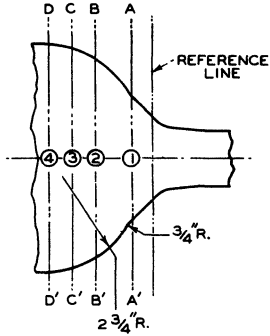
8HP4

8HP4

MONITOR KINESCOPE

FOR MAXIMUM SPACE REQUIREMENTS

SHORT-SIDE VIEW

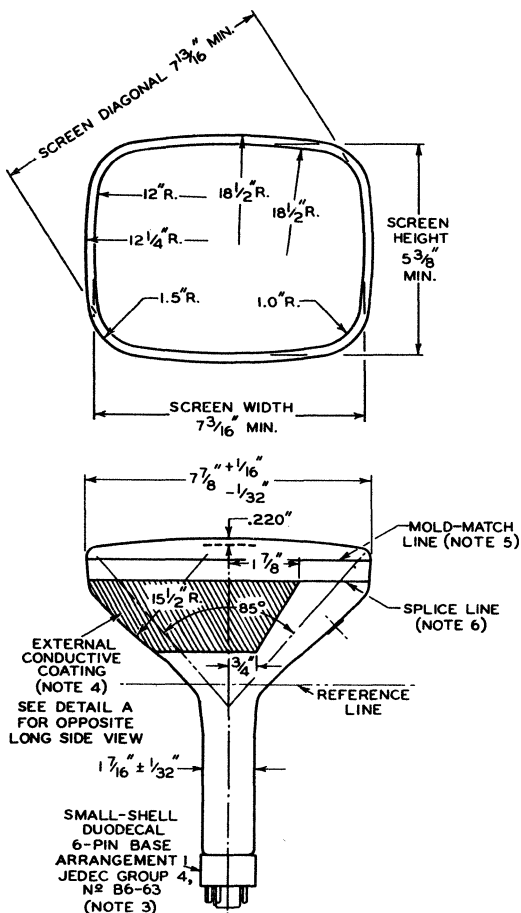


8HP4



8HP4

MONITOR KINESCOPE

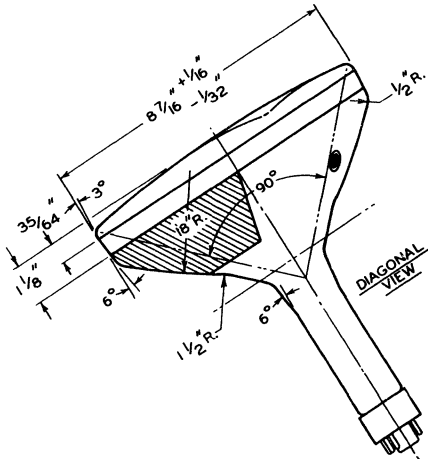
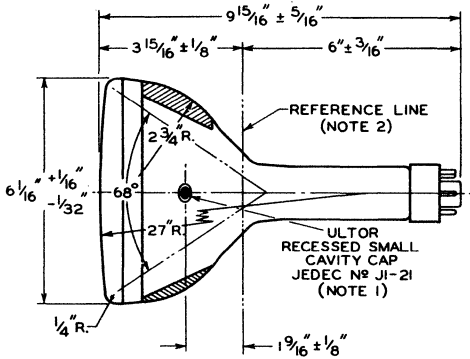




8HP4

MONITOR KINESCOPE

8HP4

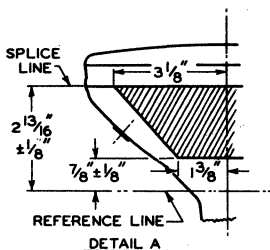


92CL-9631R2



8HP4

MONITOR KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No. G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE 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 AT THE REFERENCE LINE AND HAVING A DIAMETER OF 1-5/8 INCHES.

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: THE MAXIMUM RADIAL DISPLACEMENT OF THE PERIPHERY OF THE FACE PANEL (JUST ABOVE THE MOLD-MATCH LINE) FROM ITS EXACT CENTERED POSITION ON THE NECK AXIS IS 0.040".

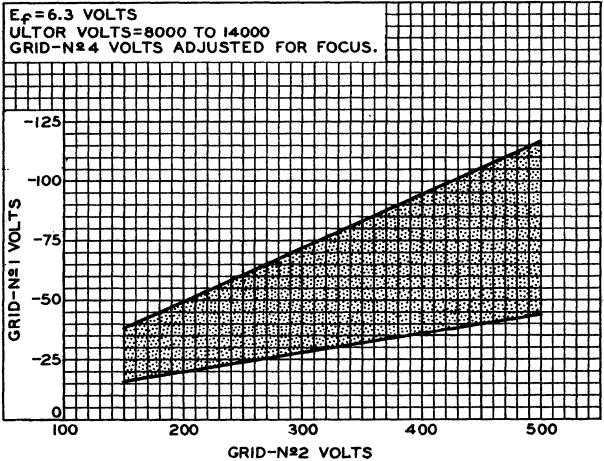
NOTE 6: BULGE AT SPLICE-LINE SEAL WILL NOT PROTRUDE BEYOND THE MAXIMUM ENVELOPE DIMENSIONS AT THE MOLD-MATCH LINE.



8HP4

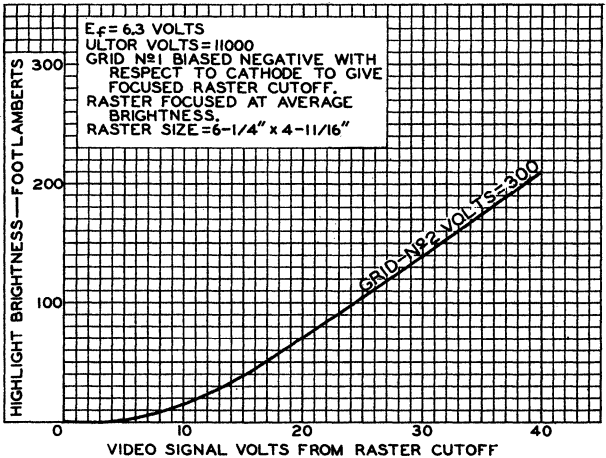
8HP4

RASTER-CUTOFF-RANGE CHART



92CS-9628

TYPICAL GRID-DRIVE CHARACTERISTIC



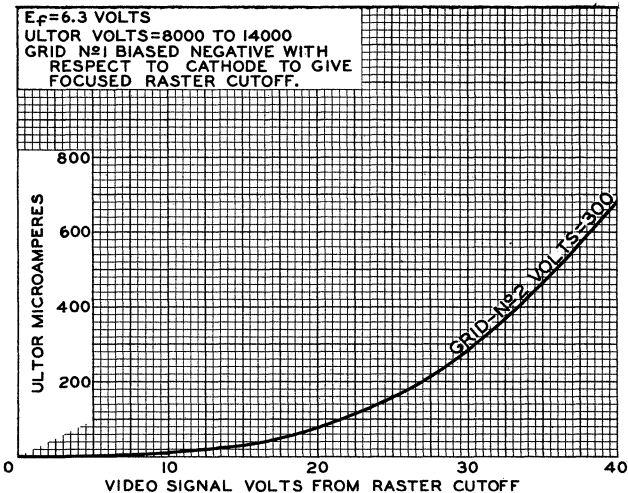
92CS-9627

8HP4



8HP4

TYPICAL GRID-DRIVE CHARACTERISTIC



92CS-9630



10BP4-A

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 $0.6 \pm 10\%$ amp

Capacitance between External Conduc-
tive Coating and Ultor { 2500 max. μf
500 min. μf

Faceplate, Spherical Filterglass

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 $17-5/8" \pm 3/8"$

Greatest Diameter of Bulb $10-1/2" \pm 1/8"$

Minimum Useful Screen Diameter $9-1/8"$

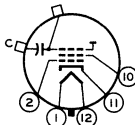
Operating Position Any

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

10FP4-A

ROUND GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current $0.6 \pm 10\%$ amp

Capacitance between External Conductive Coating and Ultor { 2500 max. $\mu\mu\text{f}$
500 min. $\mu\mu\text{f}$

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 $17\text{-}5/8" \pm 3/8"$

Greatest Diameter of Bulb $10\text{-}1/2" \pm 1/16"$

Minimum Useful Screen Diameter $9\text{-}1/8"$

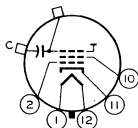
Operating Position Any

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.





10SP4

10SP4

MONITOR KINESCOPE

ALUMINIZED 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:

Grid No.1 to all other electrodes 6 μ f

Cathode to all other electrodes 5 μ f

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 Angle (Approx.) 50°

Overall Length 16-5/8" \pm 3/8"

Greatest Diameter of Bulb 10-1/2" \pm 1/16"

Minimum Useful Screen Diameter 9-1/8"

Picture Size (Within minimum useful screen area) . . 8" x 6"

Weight (Approx.) 10 lbs

Operating Position Any

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

Bulb J84

Base Small-Shell Duodecal 6-Pin (JETEC No. B6-63)

Basing Designation for BOTTOM VIEW 12Q

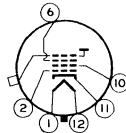
Pin 1—Heater

Pin 2—Grid No.1

Pin 6—Grid No.3

Pin 10—Grid No.2

Pin 11—Cathode



Pin 12—Heater

Cap—Ultr

(Grid No.4,

Collector)

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE 20000 max. volts

GRID—No.3 VOLTAGE 3000 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 180 max. volts

Heater positive with respect to cathode. 180 max. volts

← Indicates a change.



IOSP4

MONITOR KINESCOPE

Equipment Design Ranges:

→ For any ultor voltage (E_{C4}) between 10000* and 20000 volts
and grid-No.2 voltage (E_{C2}) between 150 and 410 volts

Grid-No.3 Voltage for focus with ultor current of 100 μ a.	11.7% to 15.9% of E_{C4}	volts
Grid-No.1 Voltage for visual extinction of 8" x 6" raster	9% to 24% of E_{C2}	volts
Maximum Grid-No.3 Current**	See Curves	μ a
Grid-No.2 Current	-15 to +15	μ a
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 μ a.	1400 to 1900	1640 to 2225	volts
Grid-No.1 Voltage for visual extinction of 8" x 6" raster	-18 to -48	-18 to -48	volts

Maximum Circuit Values:

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

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 10,000 volts.

** Grid-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

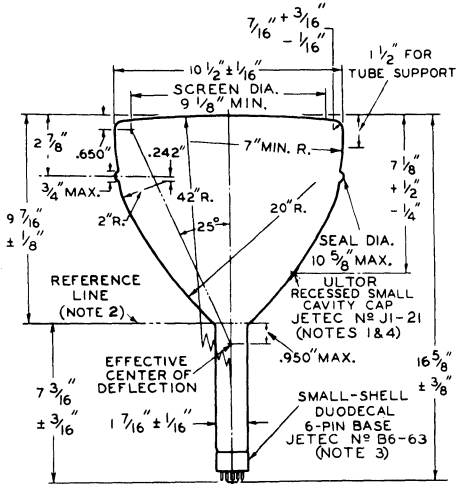
→ Indicates a change.



IOSP4

MONITOR KINESCOPE

IOSPA



92CM-7729RI

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

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

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".

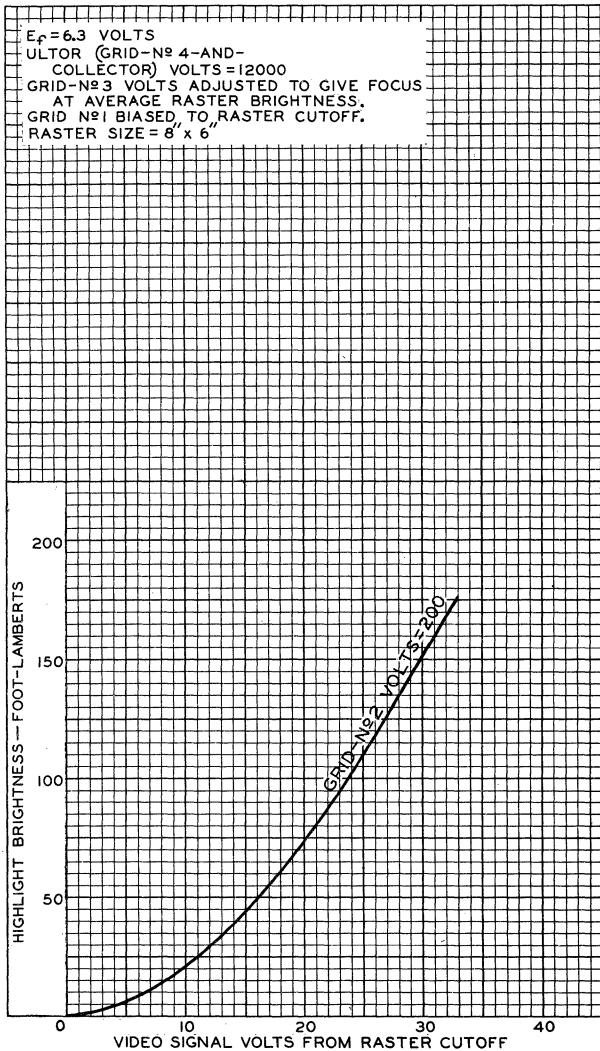
NOTE 4: TUBE SUPPORT MUST BE KEPT AT LEAST 2" AWAY FROM BULB TERMINAL.

10SP4



10SP4

AVERAGE GRID-DRIVE CHARACTERISTIC

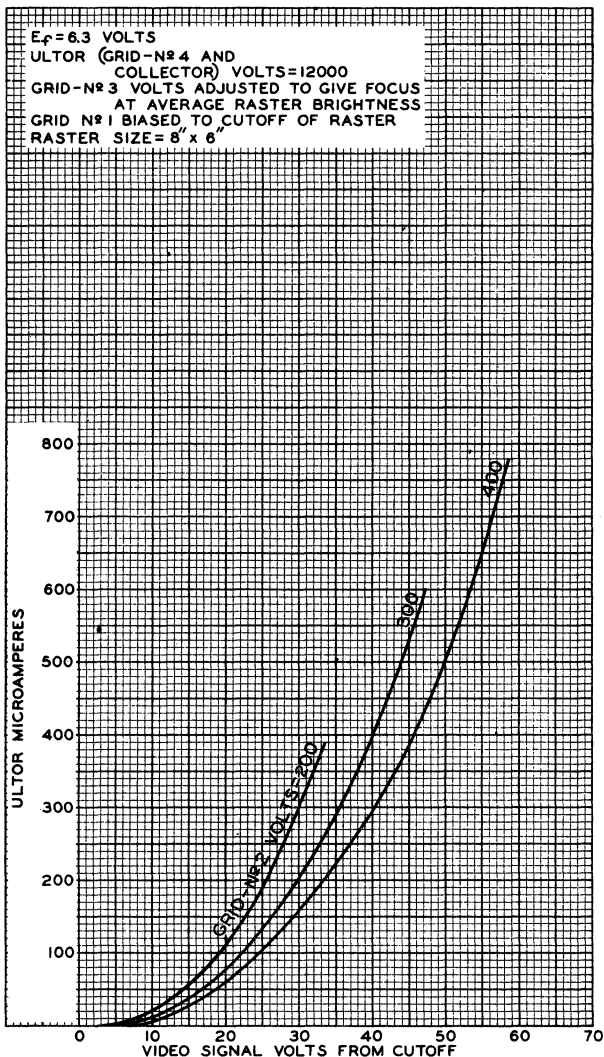




10SP4

10SP4

AVERAGE GRID-DRIVE CHARACTERISTICS



MAR. 21, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

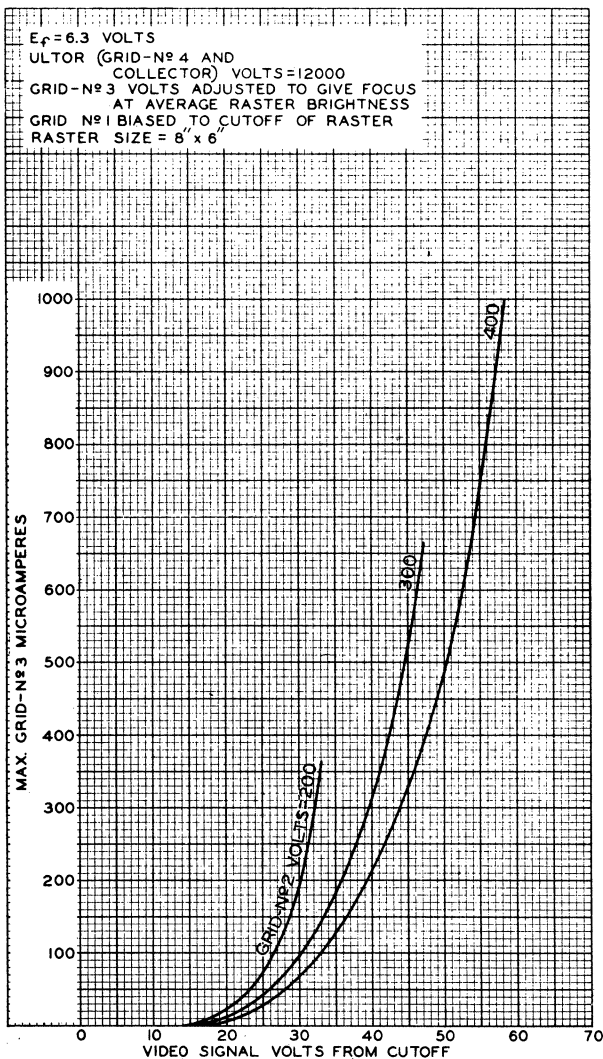
92CM-7773

10SP4



10SP4

GRID-DRIVE CHARACTERISTICS



MAR. 21, 1952

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7775



12KP4-A PICTURE TUBE

12KP4-A

ROUND GLASS TYPE
MAGNETIC FOCUS

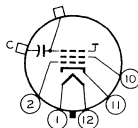
ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
 Voltage 6.3 ac or dc volts
 Current $0.6 \pm 10\%$ amp
 Capacitance between External Conduc-
 tive Coating and Ultor $\left\{ \begin{array}{l} 2500 \text{ max. } \mu\mu\text{f} \\ 500 \text{ min. } \mu\mu\text{f} \end{array} \right.$
 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 $17-5/8" \pm 3/8"$
 Greatest Diameter of Bulb $12-7/16" \pm 1/16"$
 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

14ATP4 PICTURE TUBE

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN
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	μf
Cathode to all other electrodes.	5	μf
External conductive coating to ultor	{ 1000 max. 500 min.	μf
		μf

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" \pm 5/16"

Greatest width 13-1/16" \pm 1/8"

Greatest height. 10-9/16" \pm 1/8"

Diagonal 14" \pm 1/8"

Neck length. 5-1/2" \pm 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)

14ATP4

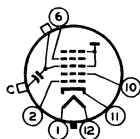


14ATP4

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^A SERVICE

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

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE.	$\left\{ \begin{array}{l} 14000 \text{ max. volts} \\ 8000 \text{ min. volts} \end{array} \right.$
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_{C5k}) between 8000 and 14000 volts
 and grid-No.2 voltage (E_{C2k}) between 200 and 500 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

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

[§], * : See next page.



14ATP4

PICTURE TUBE

14ATP4

Examples of Use of Design Ranges:

With ultor voltage of	10000	14000	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	-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. volts 8000 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 ($E_{c_1g_1}$) 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 \S	0 to 400	volts
---	----------	-------

\S 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.

\blacksquare 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



14ATP4

PICTURE TUBE

Cathode-to-Grid-No.1
Voltage (E_{k_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_{k_1}
except video drive is a negative voltage

Grid-No.4 Current -25 to +25 μ a
Grid-No.2 Current -15 to +15 μ a
Field Strength of Adjustable
Centering Magnet* 0 to 8 gauss

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

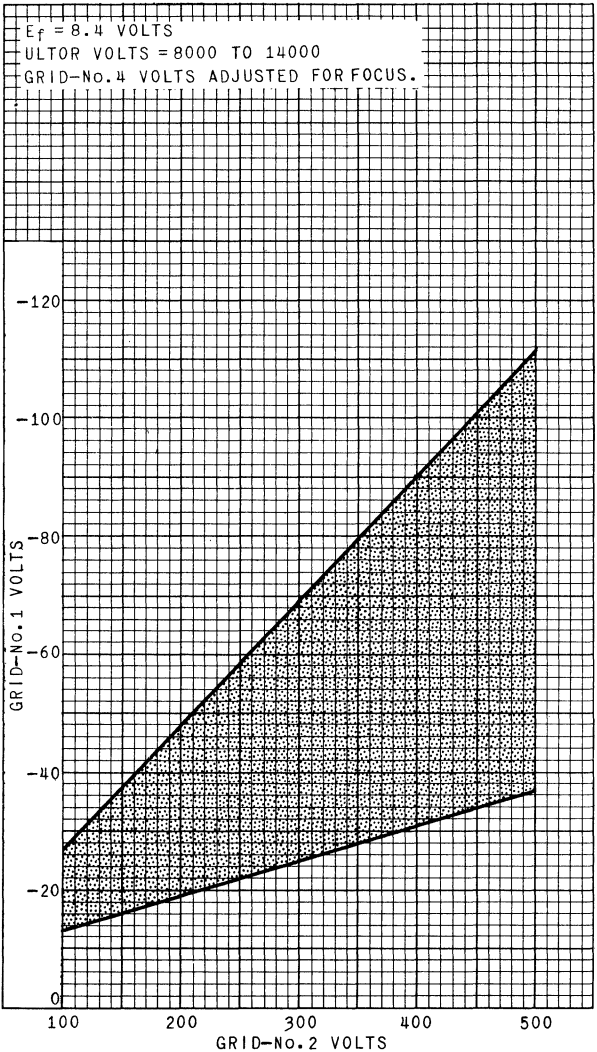


14ATP4

RASTER-CUTOFF-RANGE CHART

For Grid-Drive Service

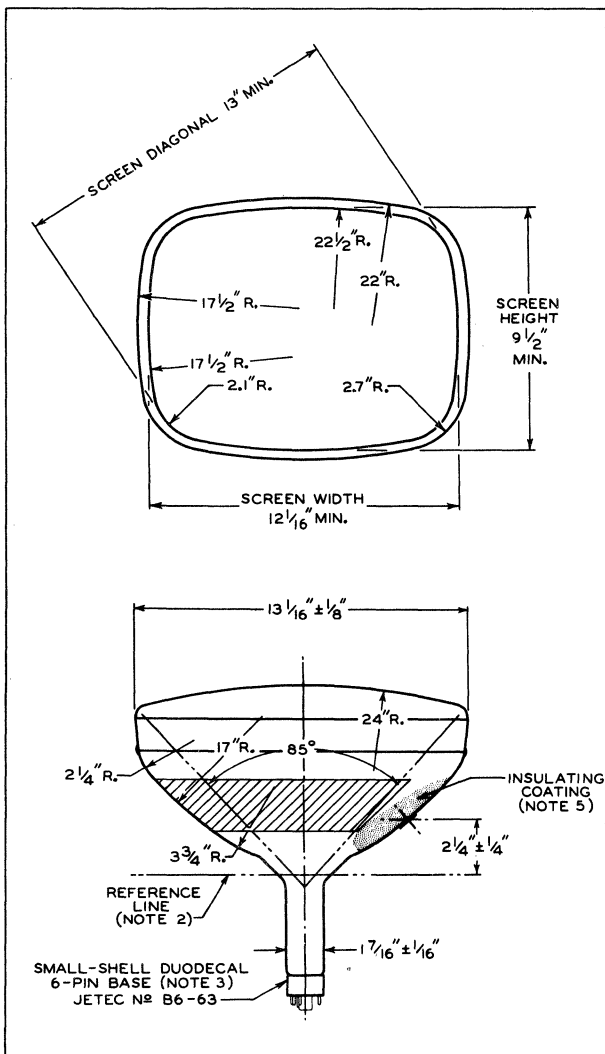
14ATP4



14ATP4



14ATP4 PICTURE TUBE

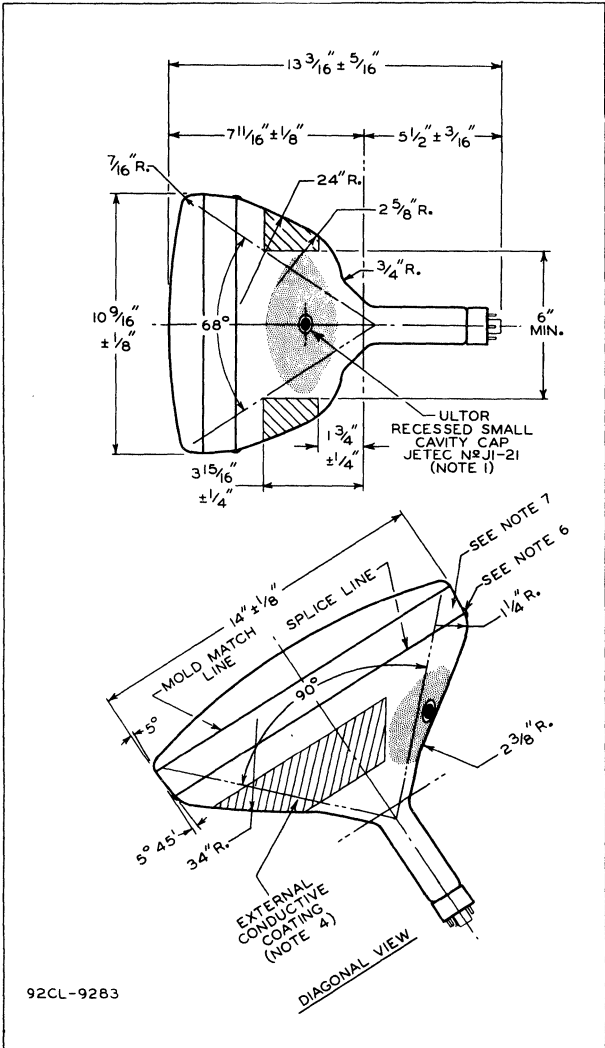




14ATP4

PICTURE TUBE

14ATP4



92CL-9283

6-57

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

CE-9283B

14ATP4



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 $\pm 30^\circ$. 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.

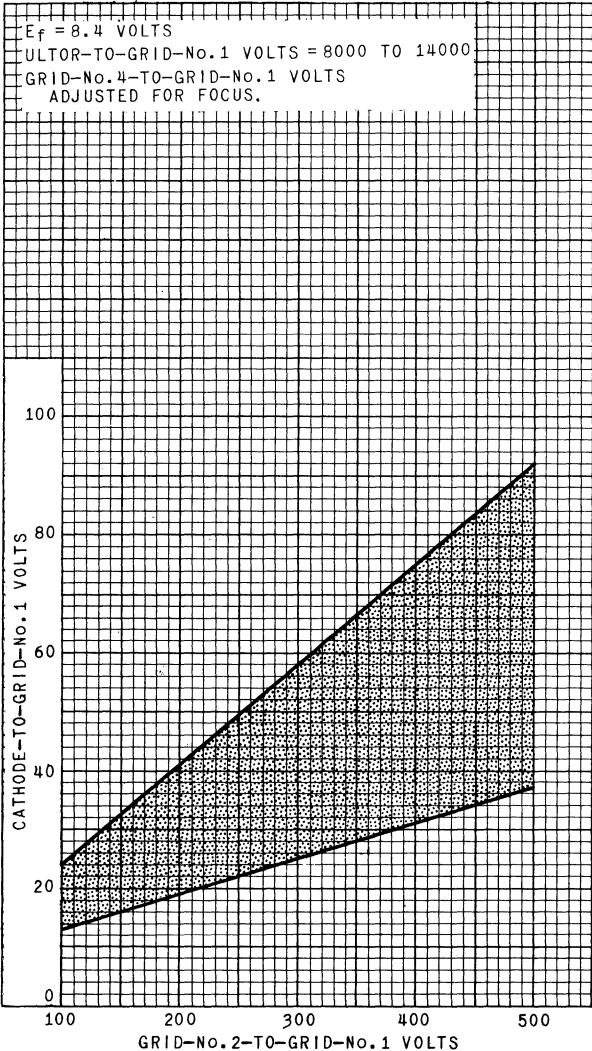
NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.



14ATP4

RASTER-CUTOFF-RANGE CHART For Cathode-Drive Service

14ATP4



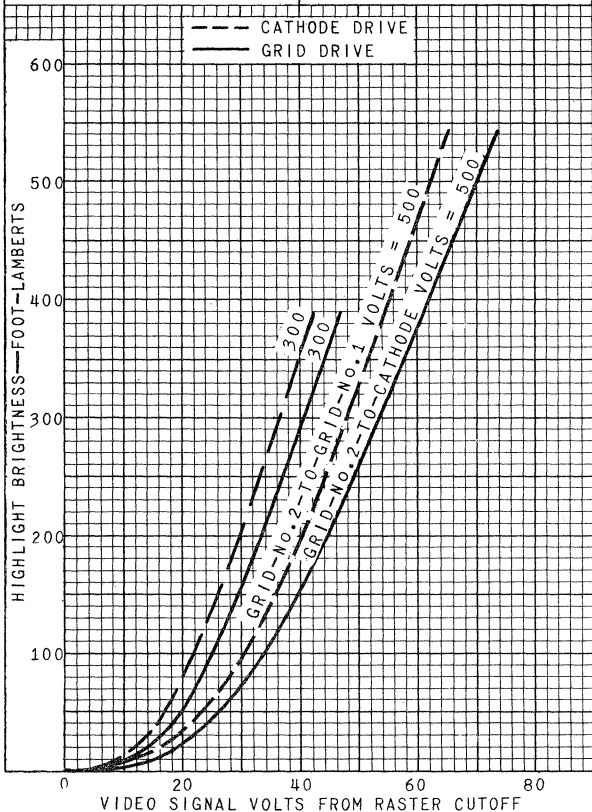
14ATP4



14ATP4

AVERAGE DRIVE CHARACTERISTICS

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



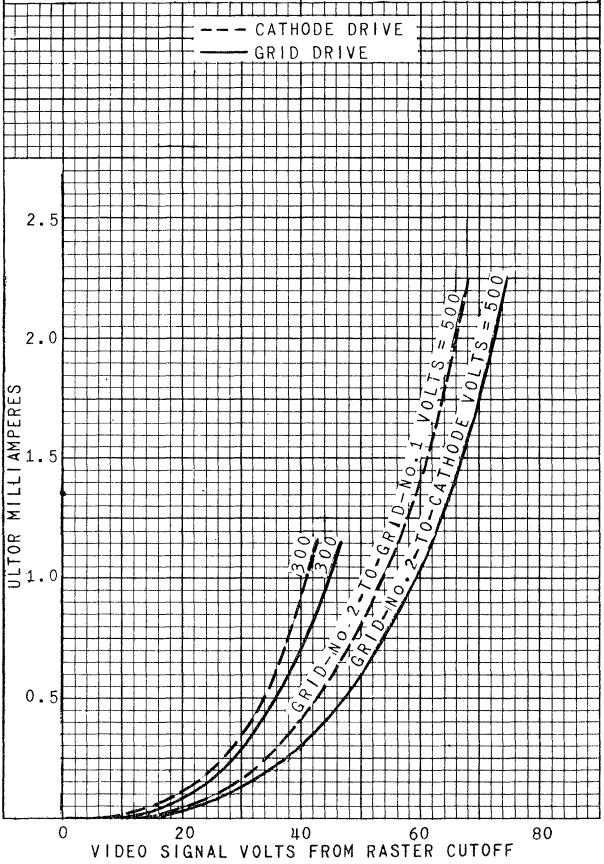


14ATP4

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 = 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.



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CS-9277



14BAP4

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
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	μuf
Cathode to all other electrodes. . . .	5	μuf
External conductive coating to ultor. .	{ 1000 max. 600 min.	μuf
		μuf
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:	

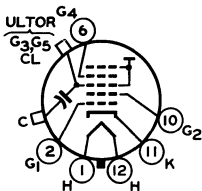
Type Regular Band
Contact area for grounding Near Reference Line

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—Ultror
(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



14BAP4

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:

<i>With ultor voltage of</i>	18000	volts
<i>and grid-No.2 voltage of</i>	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



Picture Tube

MAGNETIC FOCUS RECTANGULAR GLASS TYPE 70° MAGNETIC DEFLECTION

GENERAL DATA

Electrical:

Direct Interelectrode Capacitances:
 Cathode to all other electrodes 5 pf
 Grid No.1 to all other electrodes 6 pf
 External conductive coating to anode. $\begin{cases} 2000 \text{ max.} & \text{pf} \\ 750 \text{ min.} & \text{pf} \end{cases}$
 Heater Current at 6.3 volts 600 ± 30 ma
 Electron Gun. Ion-Trap Type Requiring External Single-Field Magnet

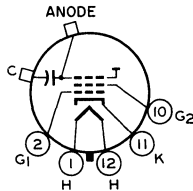
Optical:

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

Mechanical:

Weight (Approx.). 10 lbs
 Overall Length. $16-15/32" \pm 3/8"$
 Neck Length $7-3/16" \pm 3/16"$
 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 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 15500 max. volts
 GRID-No.2 VOLTAGE 450 max. volts



14EP4

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.	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.	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





14QP4-A PICTURE TUBE

14QP4-A

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

Capacitance between External Conduc-
tive Coating and Ultor { 1000 max. μmf
600 min. μmf

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 16-5/32" ± 3/8"

Greatest width 12-17/32" ± 1/8"

Greatest height 9-23/32" ± 1/8"

Diagonal 13-11/16" ± 1/8"

Neck length 6-7/8" ± 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		Cap—Ultor
Pin 2—Grid No.1		(Grid No.3,
Pin 6—Grid No.4		Grid No.5,
Pin 10—Grid No.2		Collector)
Pin 11—Cathode		C—External
Pin 12—Heater		Conductive Coating

Maximum Ratings, Design-Center Values:

ULTOR VOLTAGE 11000 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.

1AQP4-A



1AQP4-A PICTURE TUBE

GRID-No.1 VOLTAGE:

Negative-peak value.	160 max.	volts
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:		
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
--	----------	---------

14WP4

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. $\begin{cases} 1200 \text{ max.} \\ 800 \text{ min.} \end{cases}$ 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%

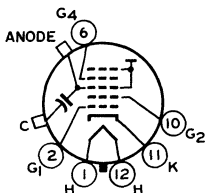
Mechanical:

Weight (Approx.). 8.5 lbs
 Overall Length. $13\text{-}3/16" \pm 5/16"$
 Neck Length $5\text{-}1/2" \pm 3/16"$
 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 J112 A/B* sheets at front of this section
 Cap Recessed Small Cavity (JEDEC No. J1-21)
 Bases (Alternates):
 Small-Shell Duodecal 6-Pin (JEDEC Group 4, No. B6-63)
 Short Small-Shell Duodecal 6-Pin (JEDEC No. B6-203)
 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





15GP22

15GP22

TRICOLOR KINESCOPE

THREE-GUN SHADOW-MASK TYPE
ELECTROSTATIC CONVERGENCE

ELECTROSTATIC FOCUS
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 $\mu\mu\text{f}$
Cathode of Blue Gun + Cathode of Green Gun + Cathode of Red Gun to All Other Electrodes	17.5 $\mu\mu\text{f}$
Grid No.3 (Of Each Gun Tied within Tube to No.3 Grids of Other Two Guns) to All Other Electrodes	12 $\mu\mu\text{f}$
Grid No.4 (Common to the Three Guns) to All Other Electrodes	7 $\mu\mu\text{f}$
External Conductive Coating to Ultor	{ 3000 max. $\mu\mu\text{f}$ 1500 min. $\mu\mu\text{f}$
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" \pm 5/32"
At metal flange	15-3/4" max.
Weight	25 lbs

15GP22



15GP22

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

**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.

MARCH 1, 1954

TUBE DEPARTMENT

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



15GP22

15GP22

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	μ amp
Maximum Grid-No.3 Current . . .	300	μ amp
Grid-No.2 Current	-15 to +15	μ amp
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.

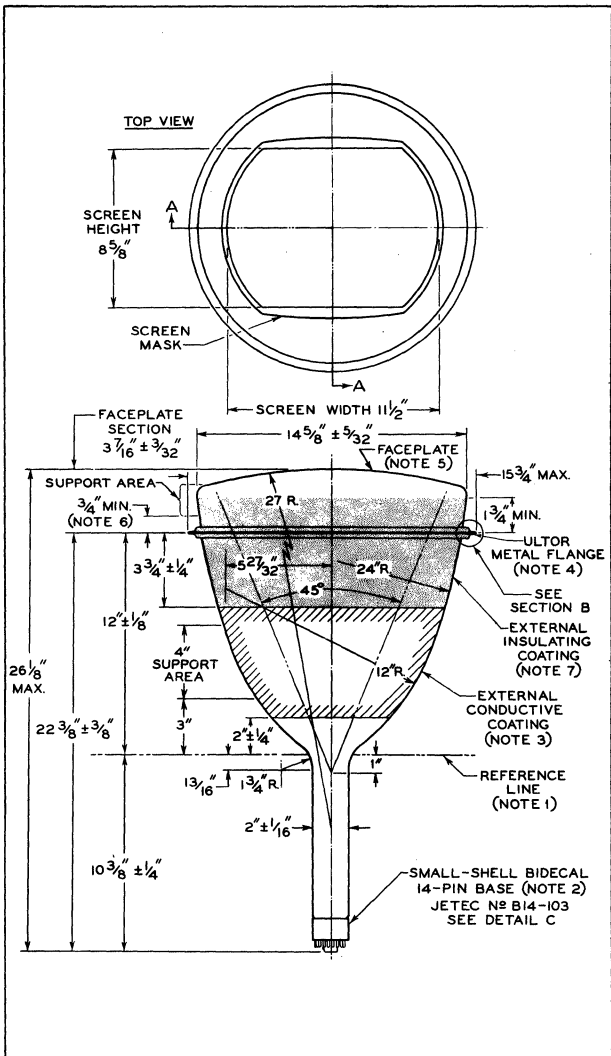
** Peak-to-peak value. This ac voltage having essentially parabolic waveform is synchronized with scanning and does not include any voltage developed during the blanking time.

15GP22



15GP22

TRICOLOR KINESCOPE



MARCH 1, 1954

TUBE DEPARTMENT

CE-8072R1A

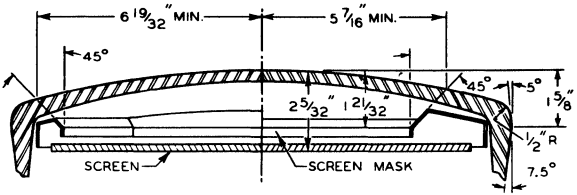
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



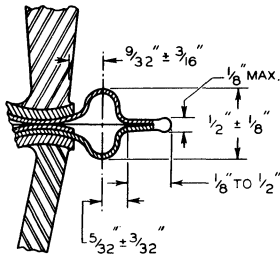
15GP22

TRICOLOR KINESCOPE

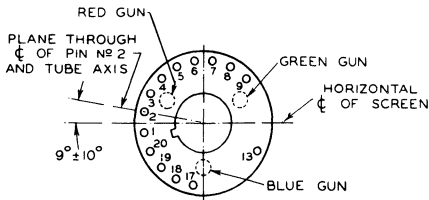
15GP22



ENLARGED SECTION A-A



ENLARGED SECTION B



BASE DETAIL C
BOTTOM VIEW

92CL - 8072RI

15GP22



15GP22

TRICOLOR KINESCOPE

NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE A CYLINDRICAL GAUGE $2.400" \pm 0.001"$ 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 LINT-LESS CLOTH.



16ADP7

OSCILLOGRAPH TUBE

METAL-SHELL ENVELOPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

16ADP7

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 (For Curves, see front of this Section) P7

Fluorescence Blue

Persistence Short

Phosphorescence Greenish-Yellow

Persistence Long

Focusing Method Magnetic

Deflection Method Magnetic

Deflection Angle (Approx.) 53°

Maximum Overall Length 22"

Greatest Diameter at Lip 15-7/8" + 1/8"

Minimum Useful Screen Diameter 14-3/8"

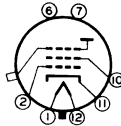
Ultor* Terminal Metal-Shell Lip

Mounting Position Any

Base Small-Shell Duodecal 7-Pin (JETEC No. B7-51)

BOTTOM VIEW

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - No
Connection
Pin 7 - No
Connection



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

Maximum Ratings, Design-Center Values:

ULTOR* VOLTAGE 14000 max. volts

GRID-No.2 VOLTAGE:

Positive value (DC or Peak AC) 410 max. volts
Negative value (DC or Peak AC) 180 max. volts

GRID-No.1 VOLTAGE:

Negative bias value 180 max. volts
Positive bias value φ 0 max. volts
Positive peak value 2 max. volts

PEAK GRID-No.1 DRIVE FROM CUTOFF 65 max. volts

* In the 16ADP7, grid No.3 which has the ultor function, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode 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.

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

16 ADP7



16 ADP7 OSCILLOGRAPH TUBE

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode 125 max. volts

Heater positive with respect to cathode 125 max. volts

Typical Operation:

Ultor Voltage* 12000 volts

Grid-No.2 Voltage 250 volts

Grid-No.1 Voltage for Visual Extinction
of Undelected Focused Spot -27 to -63 volts

Grid-No.2 Current -15 to +15 μ amp

Focusing-Coil Current (DC)^{oo} 95 \pm 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 8000 volts.

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

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

FEB. 1, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

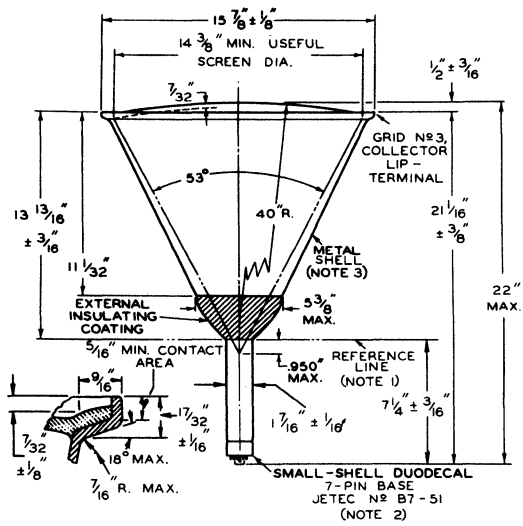
TENTATIVE DATA



16ADP7

OSCILLOGRAPH TUBE

16ADP7



DETAIL OF LIP

92CM - 7690

NOTE 1: 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 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 CIRCLE CONCENTRIC WITH METAL-SHELL AXIS AND HAVING DIAMETER OF 3".

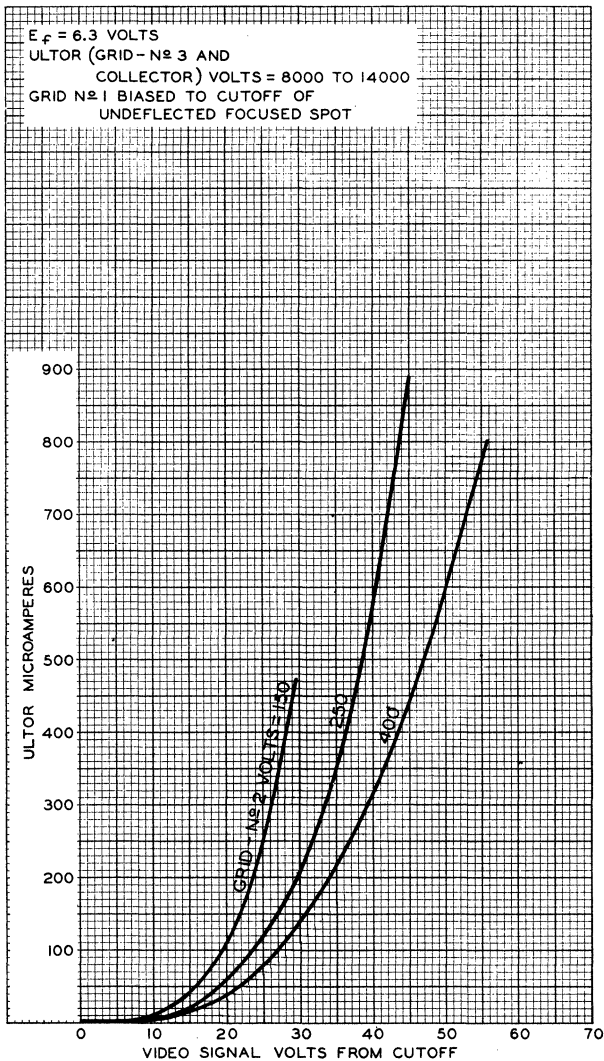
NOTE 3: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST BE INSULATED TO WITHSTAND THE MAXIMUM APPLIED ULTROR VOLTAGE.

16ADP7



16ADP7

AVERAGE GRID-DRIVE CHARACTERISTICS



OCT. 5, 1951

 TUBE DEPARTMENT
 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7692

16AYP4

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 $\begin{cases} 1300 \text{ max.} & \text{pf} \\ 800 \text{ min.} & \text{pf} \end{cases}$
 Heater Current at 6.3 volts. 450 \pm 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" \pm 1/4"
 Neck Length. 4-1/8" \pm 1/8"
 Projected Area of Screen 125 sq. in.

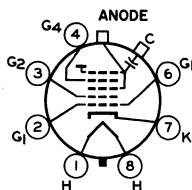
External Conductive Coating:
 Type Regular-Band
 Contact area for grounding Near Reference Line

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. $\begin{cases} 20000 \text{ max.} & \text{volts} \\ 12000 \text{ min.} & \text{volts} \end{cases}$



16AYP4

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 ^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.





16AP4-A

16AP4-A PICTURE TUBE

ROUND METAL-SHELL TYPE

MAGNETIC FOCUS

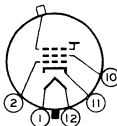
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
 Voltage 6.3 ac or dc volts
 Current $0.6 \pm 10\%$ 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 $15-7/8" \pm 1/8"$
 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.





16DP4-A

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"

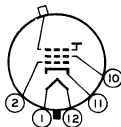
Operating Position. Any

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▲—Ultror
(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.





16GP4-B PICTURE TUBE

ROUND METAL-SHELL TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

16GP4-B

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"

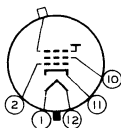
Operating Position Any

Ultor Terminal Metal-Shell Lip

Base . . Small-Shell Duodecal 5-Pin (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



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.





16LP4-A PICTURE TUBE

16LP4-A

ROUND GLASS TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current $0.6 \pm 10\%$ amp

Capacitance between External Conductive Coating and Ultor $\left\{ \begin{array}{l} 2000 \text{ max. } \mu\mu\text{f} \\ 750 \text{ min. } \mu\mu\text{f} \end{array} \right.$

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 $22-1/4" \pm 3/8"$

Greatest Diameter of Bulb $15-7/8" \pm 1/8"$

Minimum Useful Screen Diameter $14-1/2"$

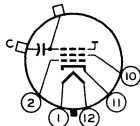
Operating Position Any

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.



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 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.

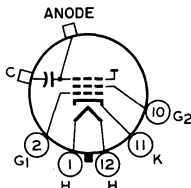
External Conductive Coating:

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





16TP4

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 Conduc-

tive 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"

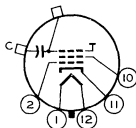
Operating Position Any

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

Base . . Small-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

← Indicates a change.

16TP4



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

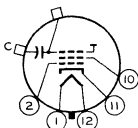
16WP4-A

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp
Capacitance between External Conduc-	
tive Coating and Ultor	{ 1500 max. μμf
	750 min. 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.



17BJP4

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
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	$\left\{ \begin{array}{l} 1500 \text{ max.} \\ 1000 \text{ min.} \end{array} \right.$	pf
		ma
Heater Current at 6.3 volts.	600 \pm 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" \pm 3/8"
Neck Length.	5-1/2" \pm 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)

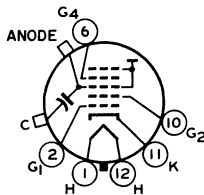
Bases (Alternates):

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.	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
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.	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.



17BP4B

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.	pf
	{ 750 min.	pf
Heater Current at 6.3 volts	600 ± 60	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.). 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:

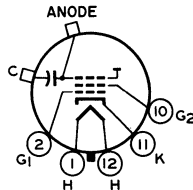
See *Picture-Tube Dimensional-Outlines and Bulb J133 B/D* sheets
at front of this section

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

Base. Small-Shell Duodecal 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

← Indicates a change.



17BP4B

→ 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.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.	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

→ Indicates a change.



17CDP4

→ 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.





17CP4

PICTURE TUBE

RECTANGULAR METAL-SHELL TYPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

17CP4

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"

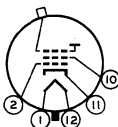
Operating Position Any

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



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:

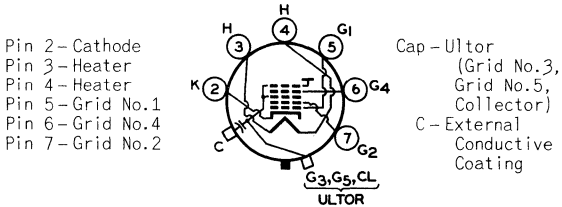
Heater Current at 6.3 volts	600 ± 5%	ma
Heater Warm-Up Time (Average)	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μf
Cathode to all other electrodes	5	μf
External conductive coating to ultor.	{ 1400 max.	μf
	{ 900 min.	μf
Electron Gun.	Type Requiring No Ion-Trap 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.	12-5/16" ± 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 <i>Picture-Tube Dimensional-Outlines</i> and <i>Bulb J132-1/2 A/B</i> 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	



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



17CSP4

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





17CFP4

PICTURE TUBE

17CFP4

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage (AC or DC)	6.3	volts
Current	0.6 ± 10%	amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes	6	μf
Cathode to all other electrodes	5	μf
External conductive coating to ultor	{ 1500 max. 1200 min.	{ μf μf

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

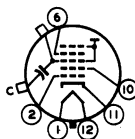
Cap. Recessed Small Cavity (JEDEC No. J1-21)

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

17CFP4



17CFP4 PICTURE TUBE

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.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_{c5k}) between 12000* and 16000 volts
and grid-No.2 voltage (E_{c2k}) 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 E_{c1k} except video drive is a positive voltage	
Grid-No.4 Current	-25 to +25	μ a
Grid-No.2 Current	-15 to +15	μ a
Field Strength of Adjust- able 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	-50 to +350	volts
Grid-No.1 Voltage for visual extinction of focused raster.	-28 to -72	volts



17CFP4

PICTURE TUBE

17CFP4

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. 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 16000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) 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_{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 μ a



17CFP4

PICTURE TUBE

Grid-No.2 Current.	-15 to +15	μ a
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses
Examples of Use of Design Ranges:		
<i>With ultor-to-grid-</i>		
<i>No.1 voltage of.</i>	<i>16000</i>	<i>volts</i>
<i>and grid-No.2-to-grid-</i>		
<i>No.1 voltage of.</i>	<i>300</i>	<i>volts</i>
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.

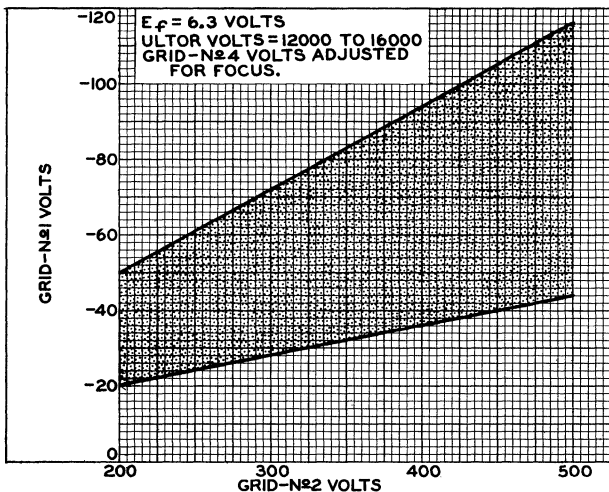
■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

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



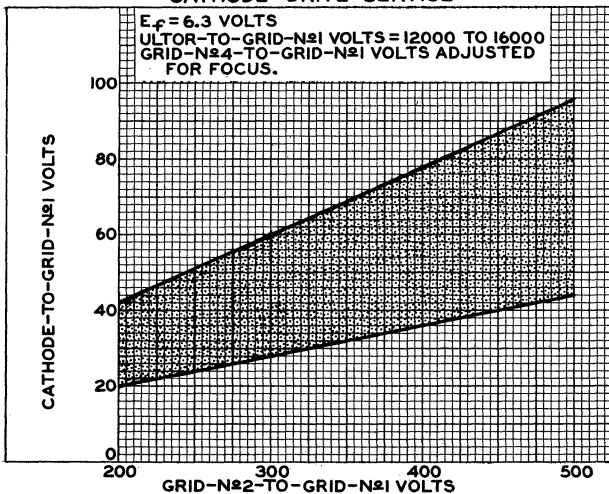
17CFP4

17CFP4 RASTER-CUTOFF-RANGE CHARTS GRID-DRIVE SERVICE



92CS-10246

CATHODE-DRIVE SERVICE



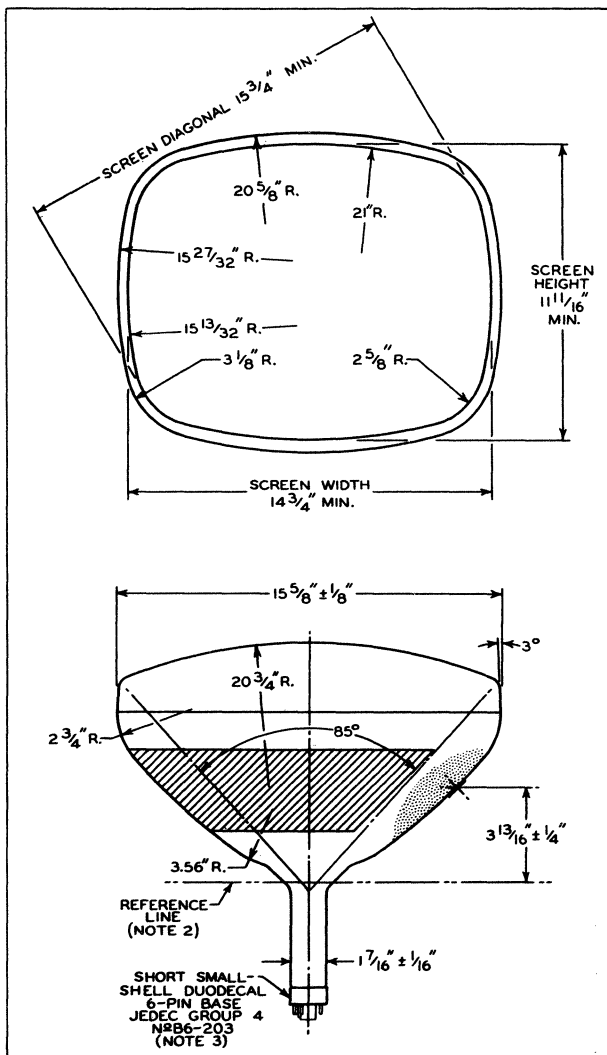
92CS-10247

17CFP4



17CFP4

PICTURE TUBE

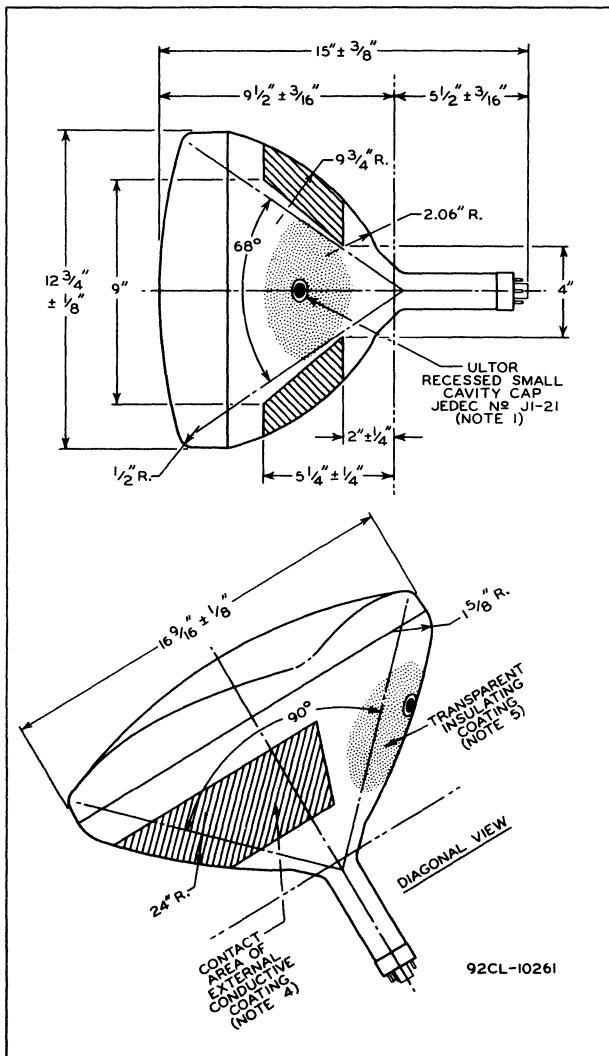




17CFP4

PICTURE TUBE

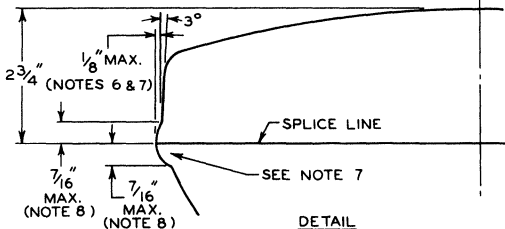
17CFP4





17CFP4

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 $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No. G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE 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" \pm 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.



17CFP4

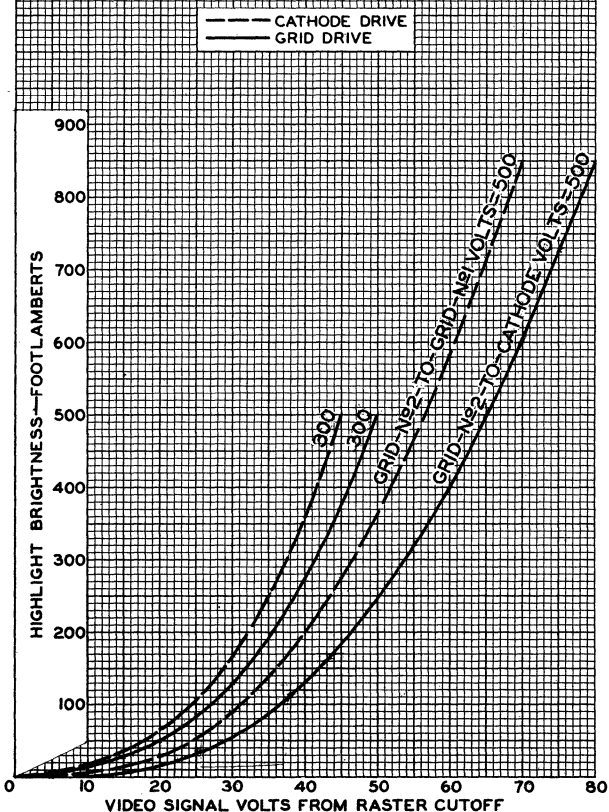
17CFP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE
 $E_f = 6.3$ VOLTS
 ULTOR-TO-GRID-№1 VOLTS = 16000
 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.
 RASTER FOCUSED AT AVERAGE BRIGHTNESS.
 RASTER SIZE = 14" x 10 1/2"

GRID-DRIVE SERVICE
 $E_f = 6.3$ VOLTS
 ULTOR VOLTS = 16000
 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
 RASTER FOCUSED AT AVERAGE BRIGHTNESS.
 RASTER SIZE = 14" x 10 1/2"

I.C.I. COORDINATES OF SCREEN: $x=0.270$, $y=0.300$



17CFP4



17CFP4

AVERAGE DRIVE CHARACTERISTICS

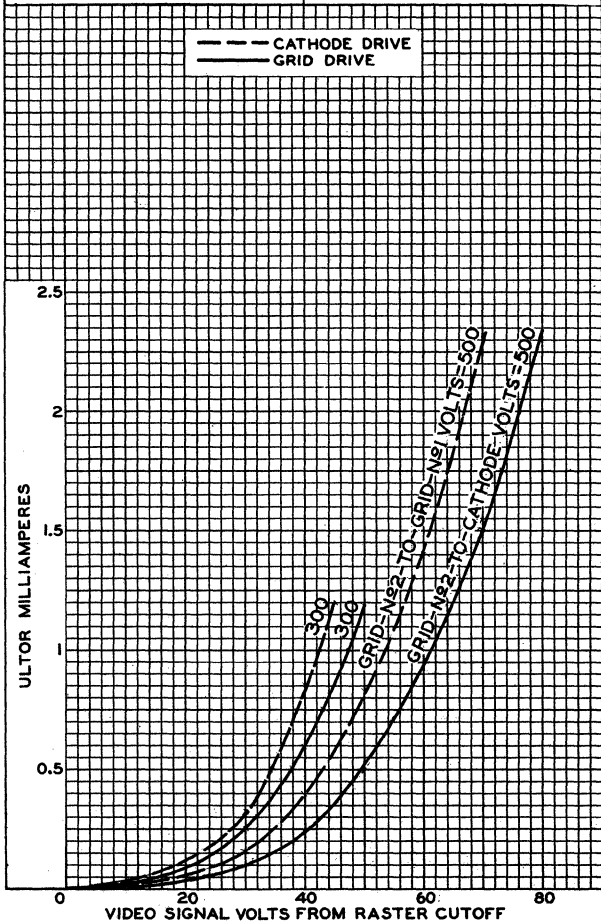
CATHODE-DRIVE SERVICE

$E_f = 6.3$ VOLTS
 ULTOR-TO-GRID- $N_{\#1}$
 VOLTS = 12000 TO 16000
 CATHODE BIASED POSITIVE WITH
 RESPECT TO GRID $N_{\#1}$ TO GIVE
 FOCUSED RASTER CUTOFF.

GRID-DRIVE SERVICE

$E_f = 6.3$ VOLTS
 ULTOR VOLTS = 12000 TO 16000
 GRID $N_{\#1}$ BIASED NEGATIVE WITH
 RESPECT TO CATHODE TO GIVE
 FOCUSED RASTER CUTOFF.

--- CATHODE DRIVE
 ——— GRID DRIVE



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9243



17CYP4

PICTURE TUBE

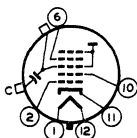
RECTANGULAR GLASS TYPE ALUMINIZED SCREEN
 LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

17CYP4

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	μf
Cathode to all other electrodes	5	μf
External conductive coating to ultor . .	{ 1500 max.	μf
	{ 1000 min.	μf
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" \pm 3/8"	
Greatest width	15-5/8" \pm 1/8"	
Greatest height	12-3/4" \pm 1/8"	
Diagonal	16-9/16" \pm 1/8"	
Neck length	4-1/2" \pm 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		Cap—Ultor
Pin 2—Grid No.1		(Grid No.3,
Pin 6—Grid No.4		Grid No.5,
Pin 10—Grid No.2		Collector)
Pin 11—Cathode		C—External
Pin 12—Heater		Conductive
		Coating



17CYP4



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_{c5k}) between 12000* and 16000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus[▲] . . . -50 to +350 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 μ a

Grid-No.2 Current. -15 to +15 μ a

Field Strength of Adjustable Centering Magnet* 0 to 8 gauss

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.	-50 to +350	volts
Grid-No.1 Voltage for visual extinction of focused raster	-28 to -72	volts



17CYP4

17CYP4

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 $\left\{ \begin{array}{l} 16000 \text{ max.} \\ 12000^* \text{ min.} \end{array} \right.$ 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_{c5g1}) between 12000 and 16000 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[§] 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 value

Grid-No.4 Current. -25 to +25 μ a
 Grid-No.2 Current. -15 to +15 μ a
 Field Strength of Adjustable Centering Magnet* 0 to 8 gauss

17CYP4



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.

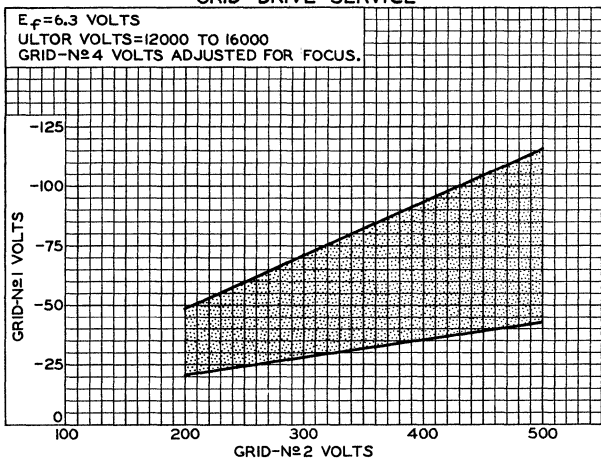
*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section.*



17CYP4

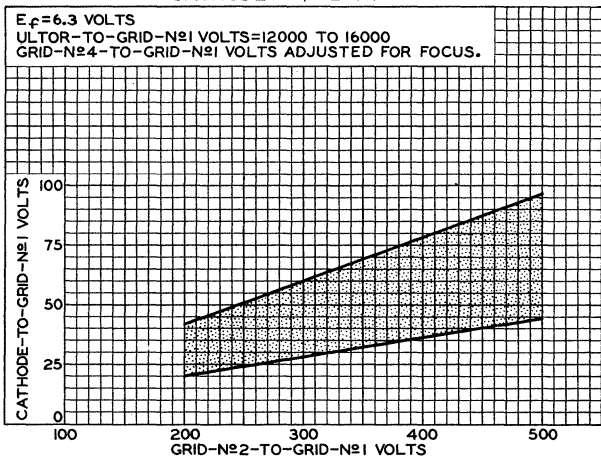
17CYP4

RASTER-CUTOFF-RANGE CHARTS GRID-DRIVE SERVICE



92CS-10385

CATHODE-DRIVE SERVICE



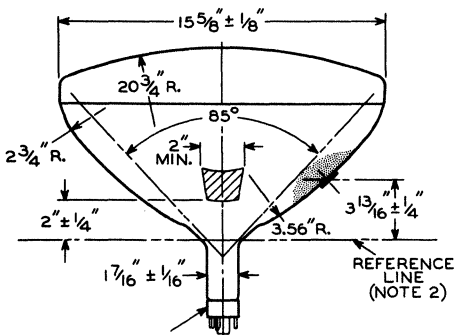
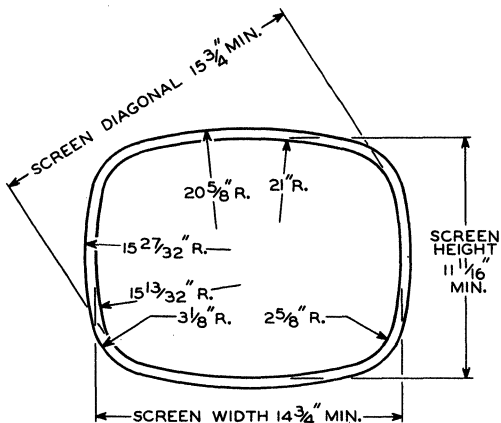
92CS-10384

17CYP4



17CYP4

PICTURE TUBE



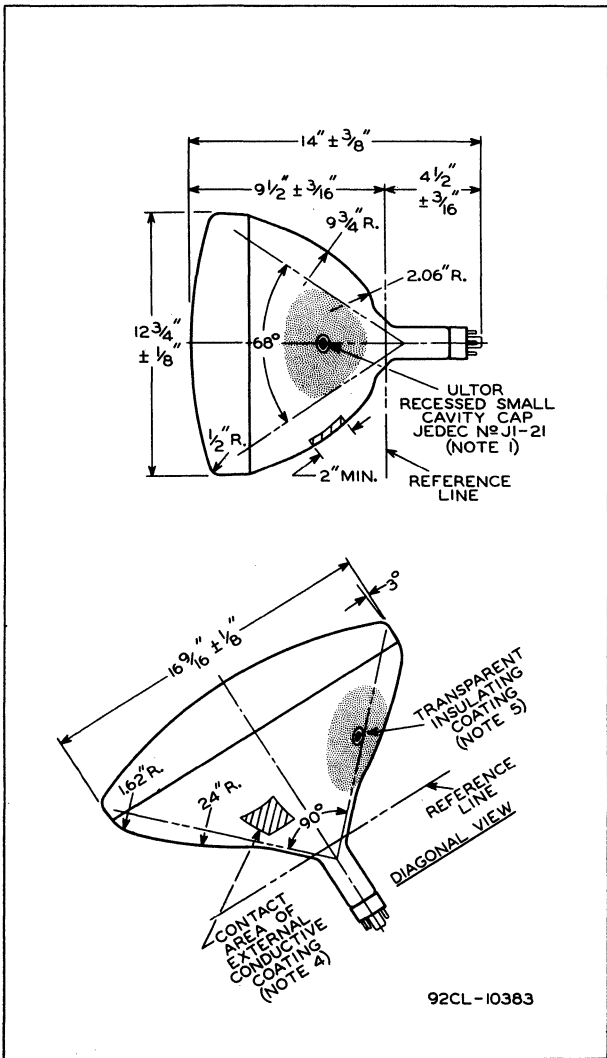
SHORT SMALL-SHELL DUODECAL
6-PIN BASE
JEDEC GROUP 4, N²B6-203
(NOTE 3)



17CYP4

PICTURE TUBE

17CYP4

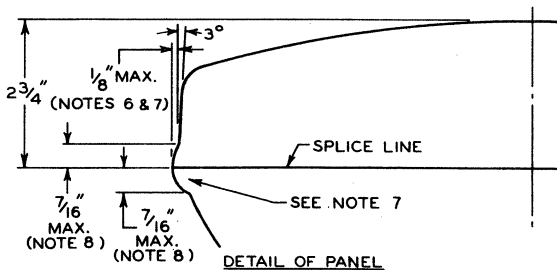


17CYP4



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 $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No. G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE 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 $2\text{--}3\frac{3}{4}$ ".

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 $2\text{--}9\frac{3}{32}$ " $\pm 1/32$ " 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.



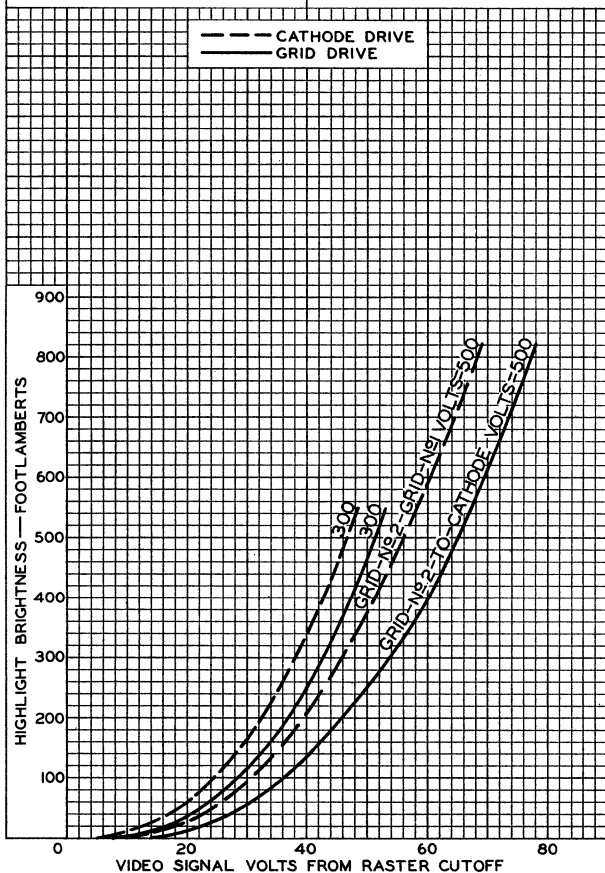
17CYP4

17CYP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE
 $E_f = 6.3$ VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000
CATHODE BIASED POSITIVE WITH
RESPECT TO GRID №1 TO GIVE
FOCUSED RASTER CUTOFF.
RASTER FOCUSED
AT AVERAGE BRIGHTNESS.
RASTER SIZE = $14" \times 10\frac{1}{2}"$

GRID-DRIVE SERVICE
 $E_f = 6.3$ VOLTS
ULTOR VOLTS = 16000
GRID №1 BIASED NEGATIVE WITH
RESPECT TO CATHODE TO GIVE
FOCUSED RASTER CUTOFF.
RASTER FOCUSED
AT AVERAGE BRIGHTNESS.
RASTER SIZE = $14" \times 10\frac{1}{2}"$



17CYP4



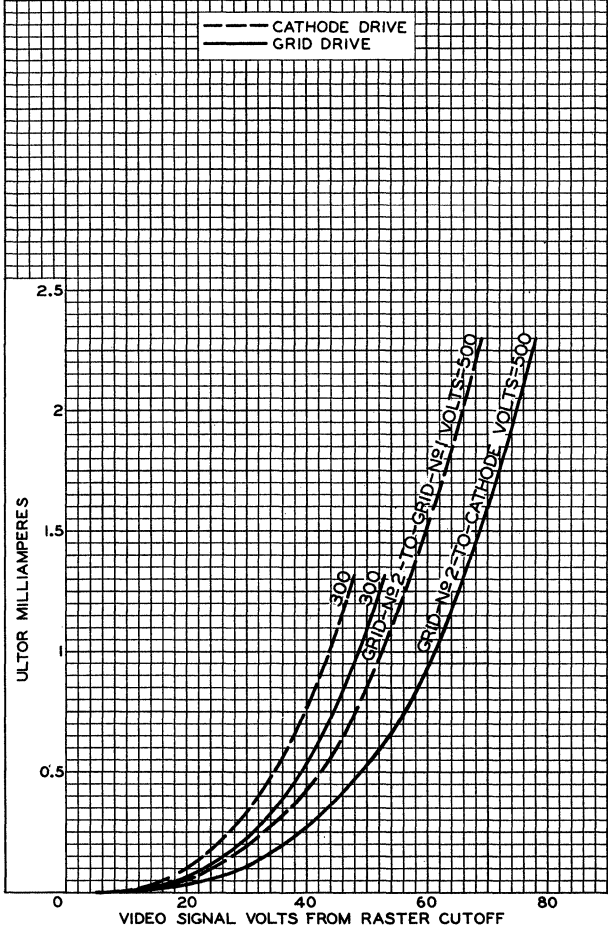
17CYP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE
 $E_f = 6.3$ VOLTS
 ULTOR-TO-GRID-No1
 VOLTS=12000 TO 16000
 CATHODE BIASED POSITIVE WITH
 RESPECT TO GRID No1 TO GIVE
 FOCUSED RASTER CUTOFF.

GRID-DRIVE SERVICE
 $E_f = 6.3$ VOLTS
 ULTOR VOLTS=12000 TO 16000
 GRID No1 BIASED NEGATIVE WITH
 RESPECT TO CATHODE TO GIVE
 FOCUSED RASTER CUTOFF.

--- CATHODE DRIVE
 ——— GRID DRIVE





17DAP4 PICTURE TUBE

17DAP4

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. μmf
900 min. μmf

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.

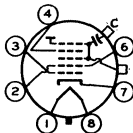
Operating Position Any

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 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 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

17DAP4



17DAP4

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*



I7DKP4 PICTURE TUBE

I7DKP4

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)
----------------	---

17DKP4

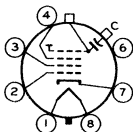


17DKP4

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_{C4k}) between 12000 and 16000 volts and grid-No.2 voltage (E_{C2k}) between 400 and 550 volts

Grid-No.3 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.3 Current	-25 to +25	μ a
Grid-No.2 Current	-15 to +15	μ a



17DKP4

PICTURE TUBE

17DKP4

Field Strength of Adjustable Centering Magnet . . .	0 to 12	gausses
---	---------	---------

Examples of Use of Design Ranges:

<i>With ultor voltage of</i>	16000	16000	volts
<i>and grid-No. 2 voltage of</i>	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.	{ 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_{c4g1}) between 12000 and 16000 volts and grid-No. 2-to-grid-No. 1 voltage (E_{c2g1}) between 400 and 690 volts

Grid-No. 3-to-Grid-No. 1 Voltage for focus [§]	0 to 400	volts
---	----------	-------

17DKP4



17DKP4

PICTURE TUBE

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.3 Current. -25 to +25 μ a

Grid-No.2 Current. -15 to +15 μ a

Field Strength of Adjust-
able Centering Magnet[†]. 0 to 12 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 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

17DKP4

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 when required.

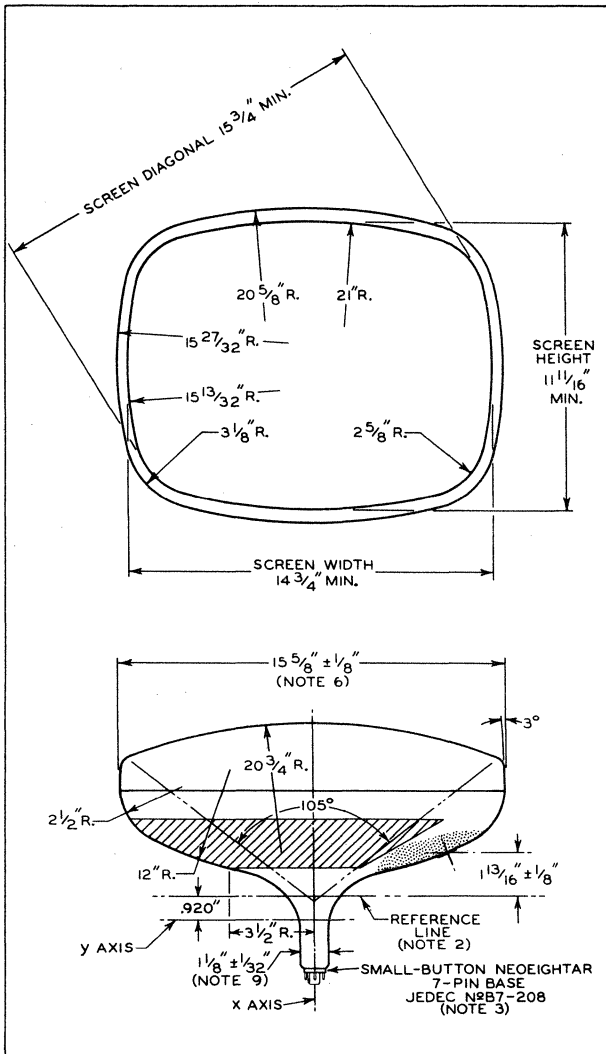
*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

17DKP4



17DKP4

PICTURE TUBE

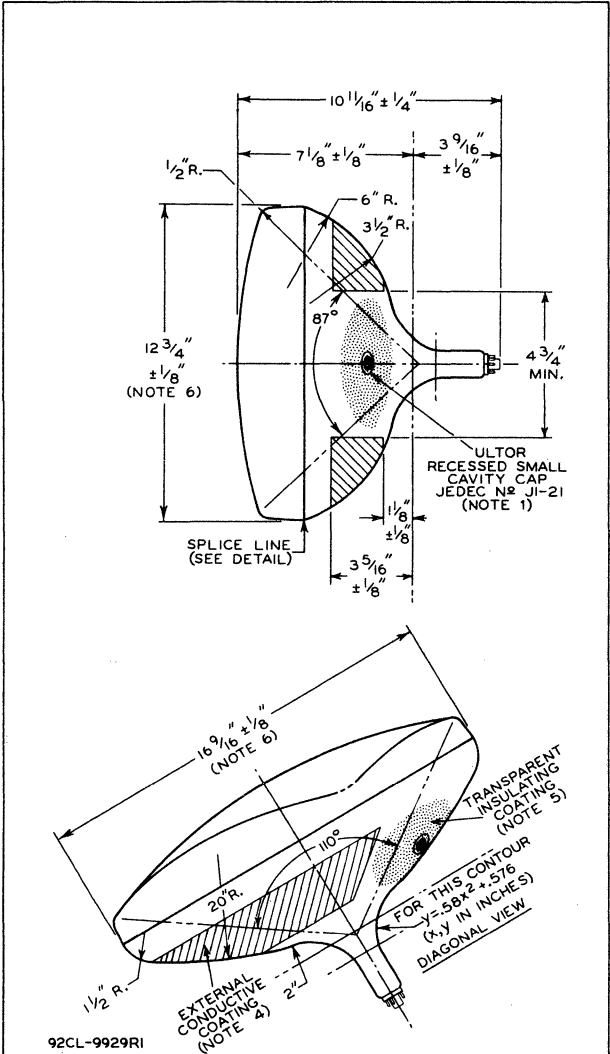




17DKP4

PICTURE TUBE

17DKP4

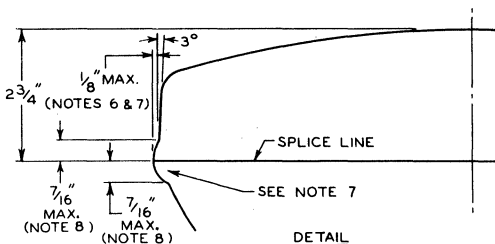


17DKP4



17DKP4

PICTURE TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. 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 2-9/32" \pm 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.

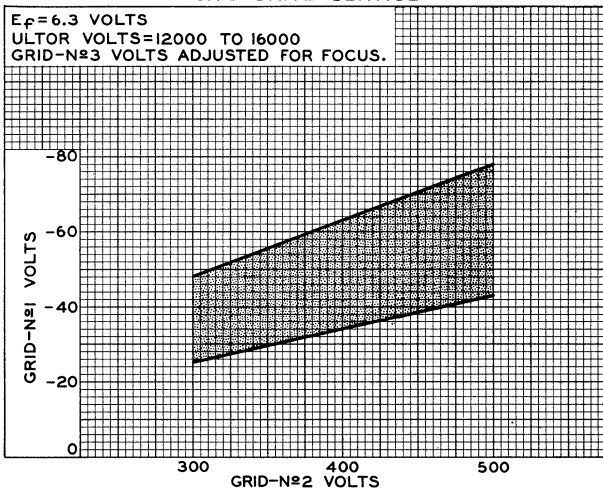
NOTE 9: NECK DIAMETER IS MAINTAINED TO AT LEAST 2-7/16" FROM REFERENCE LINE.



17DKP4

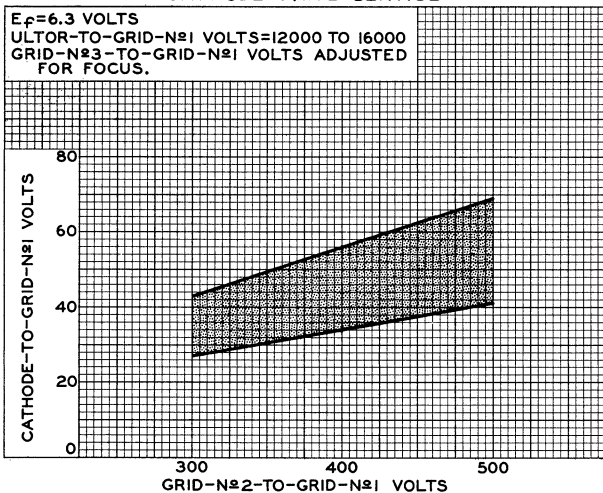
17DKP4

RASTER-CUTOFF-RANGE CHARTS GRID-DRIVE SERVICE



92CS-9930

CATHODE-DRIVE SERVICE



92CS-9931

17DKP4



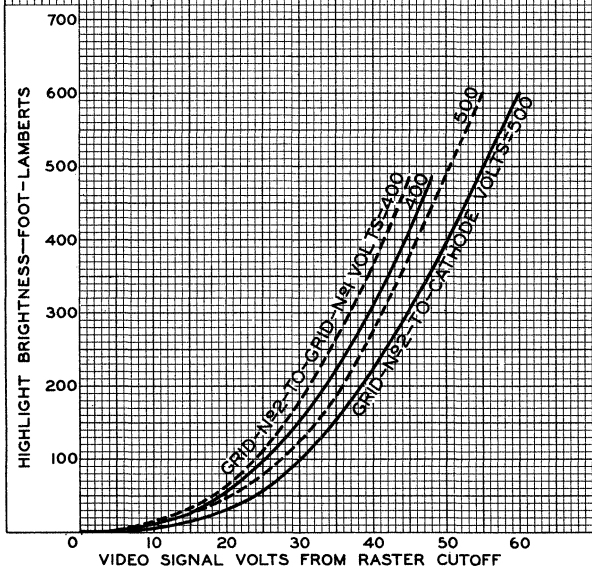
17DKP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
$E_f = 6.3$ VOLTS	$E_f = 6.3$ VOLTS
ULTOR-TO-GRID- $N \neq 1$ VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID $N \neq 1$ TO GIVE FOCUSED RASTER CUTOFF.	GRID $N \neq 1$ 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 10 1/2"	RASTER SIZE = 14" x 10 1/2"

I.C.I. COORDINATES OF SCREEN: $x=0.270$, $y=0.300$

--- CATHODE DRIVE
 ——— GRID DRIVE



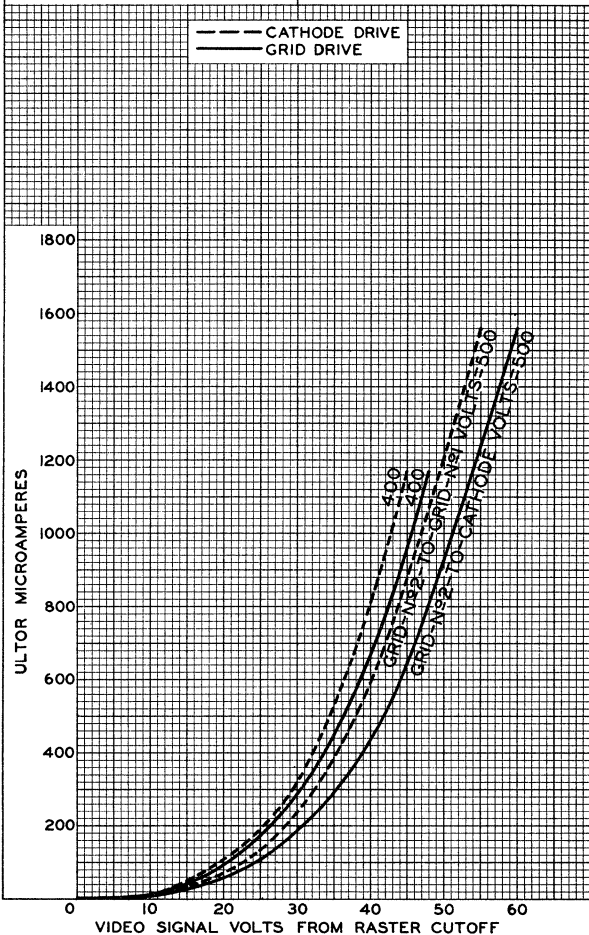


17DKP4

17DKP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
$E_f = 6.3$ VOLTS	$E_f = 6.3$ VOLTS
ULTOR-TO-GRID- $N_{\#1}$	ULTOR VOLTS = 12000 TO 16000
VOLTS = 12000 TO 16000	GRID $N_{\#1}$ BIASED NEGATIVE WITH
CATHODE BIASED POSITIVE WITH	RESPECT TO CATHODE TO GIVE
RESPECT TO GRID $N_{\#1}$ TO GIVE	FOCUSED RASTER CUTOFF.
FOCUSED RASTER CUTOFF.	





Picture Tube

SHORT RECTANGULAR GLASS TYPE
 LOW-VOLTAGE ELECTROSTATIC FOCUS
 LOW GRID-No.2 VOLTAGE

ALUMINIZED SCREEN
 110° MAGNETIC DEFLECTION
 CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

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
Electron Gun Type Requiring		No Ion-Trap Magnet

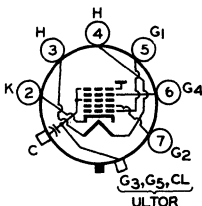
Optical:

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 <i>Picture-Tube Dimensional-Outlines</i> and <i>Bulb J132-1/2 A/B</i> 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



17DRP4

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. 900 min.	pf
		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:

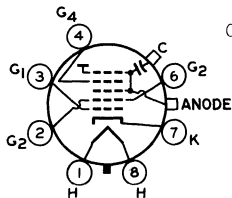
See *Picture-Tube Dimensional-Outlines and Bulb J132-1/2 A/B* sheets at front of this section

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.	volts
	{ 2.4 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	450 max.	volts
After equipment warm-up period.	200 max.	volts
Heater positive with respect to cathode:		
Combined AC and DC voltage.	200 max.	volts
DC component.	100 max.	volts

Typical Operating Conditions for Grid-Drive Service:

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

Anode Voltage	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

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	$\mu\mu\text{f}$
Cathode to all other electrodes	5	$\mu\mu\text{f}$
External conductive coating to ultor.	{ 1500 max. 1000 min.	$\mu\mu\text{f}$ $\mu\mu\text{f}$

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" \pm 3/16"

Greatest width 15-5/8" \pm 1/8"

Greatest height 12-3/4" \pm 1/8"

Diagonal 16-9/16" \pm 1/8"

Neck length 4-1/8" \pm 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

17DSPA



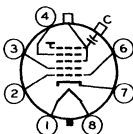
17DSPA

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_{c5k}) between 12000[‡] and 18000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus [§]	0 to 400	volts
Grid-No.1 Voltage (E_{c1k}) for visual extinction of focused raster.	<i>See Raster-Cutoff-Range Chart for Grid-Drive Service</i>	
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	



17DSP4

PICTURE TUBE

17DSP4

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

Examples of Use of Design Ranges:

<i>With ultor voltage of</i>	16000	16000	volts
<i>and grid-No.2 voltage of</i>	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	-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

17DSPA



17DSPA

PICTURE TUBE

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g1}) between 12000[#] and 18000 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§.	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 value	
Grid-No.4 Current	-25 to +25	μ a
Grid-No.2 Current	-15 to +15	μ a
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	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 17DSPA 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

17DSP4

- * 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

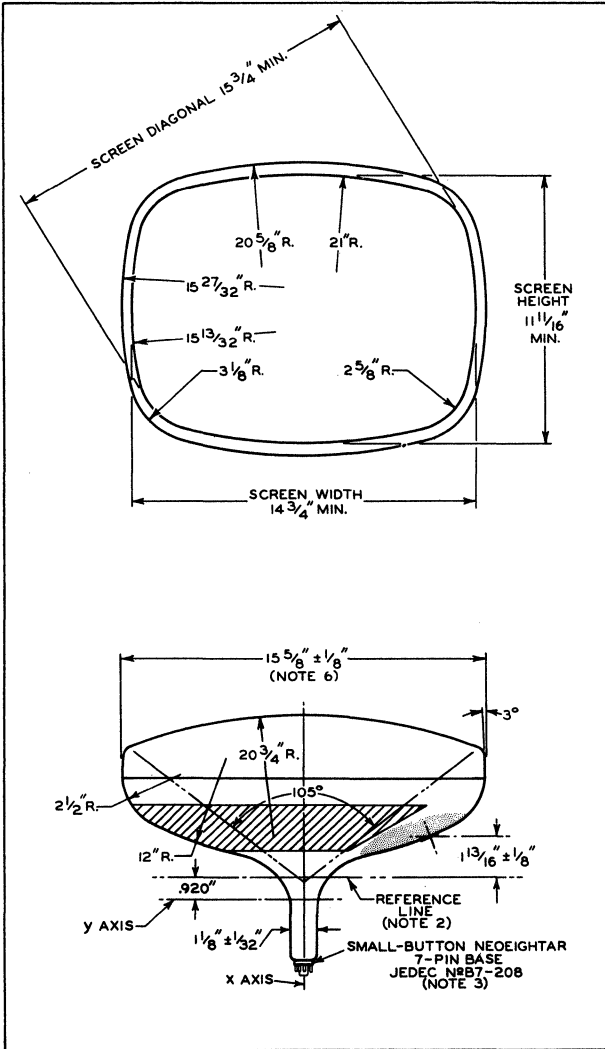
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 17DSP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion 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*

17DSP4



17DSP4 PICTURE TUBE

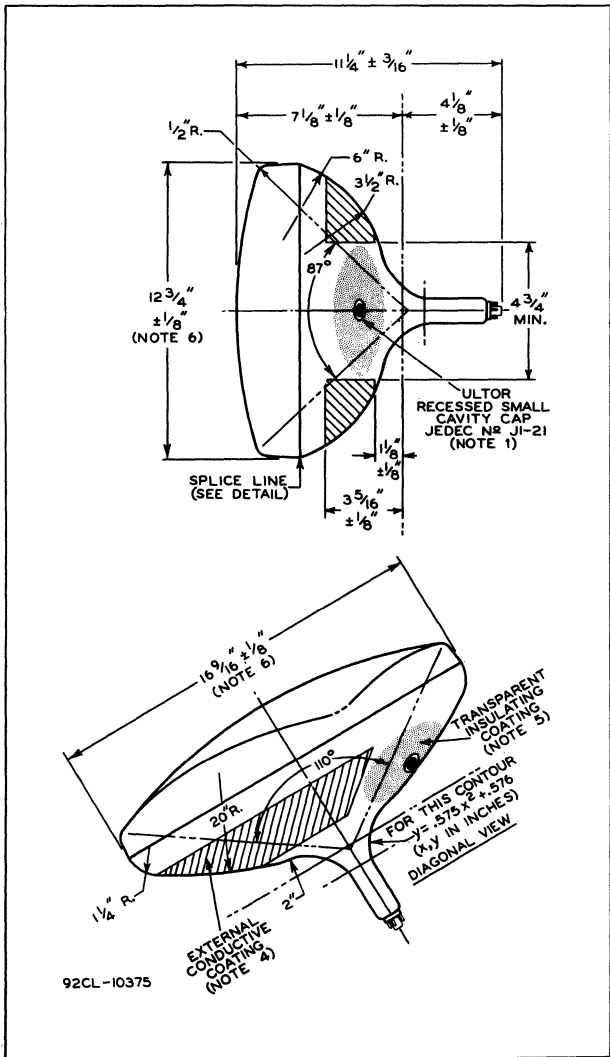




17DSP4

PICTURE TUBE

17DSP4

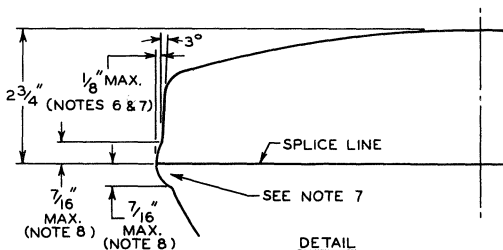


17DSP4



17DSP4

PICTURE TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. 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" \pm 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.

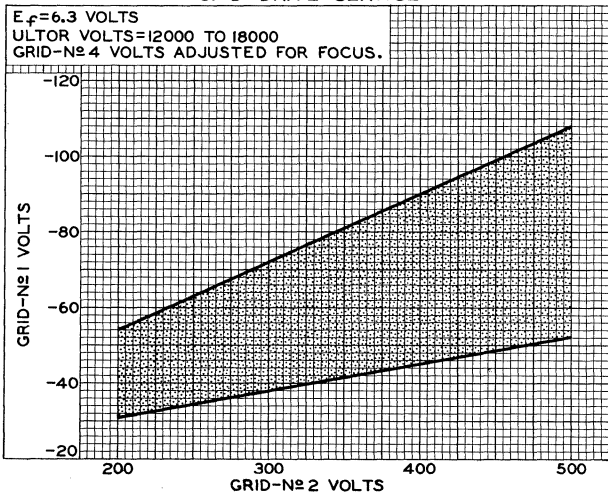
NOTE 8: THE TUBE SHOULD BE SUPPORTED ON BOTH SIDES OF THE BULGE. THE MECHANISM USED SHOULD PROVIDE CLEARANCE FOR THE MAXIMUM DIMENSIONS OF THE BULGE. SUPPORTS MUST BE SPACED FROM THE TUBE BY THE USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.



17DSP4

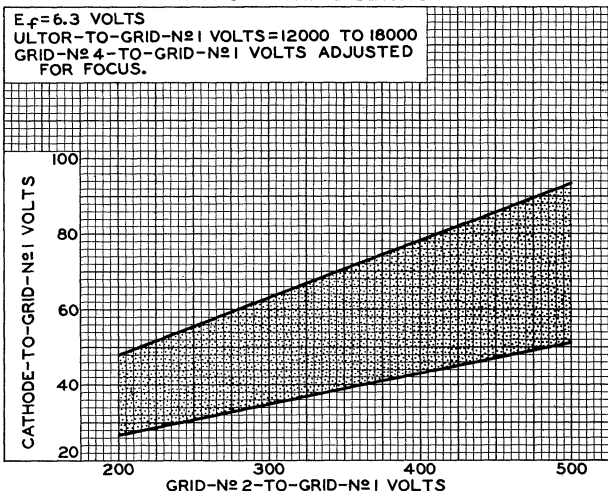
17DSP4

RASTER-CUTOFF-RANGE CHARTS GRID-DRIVE SERVICE



92CS-10376

CATHODE-DRIVE SERVICE



92CS-10377

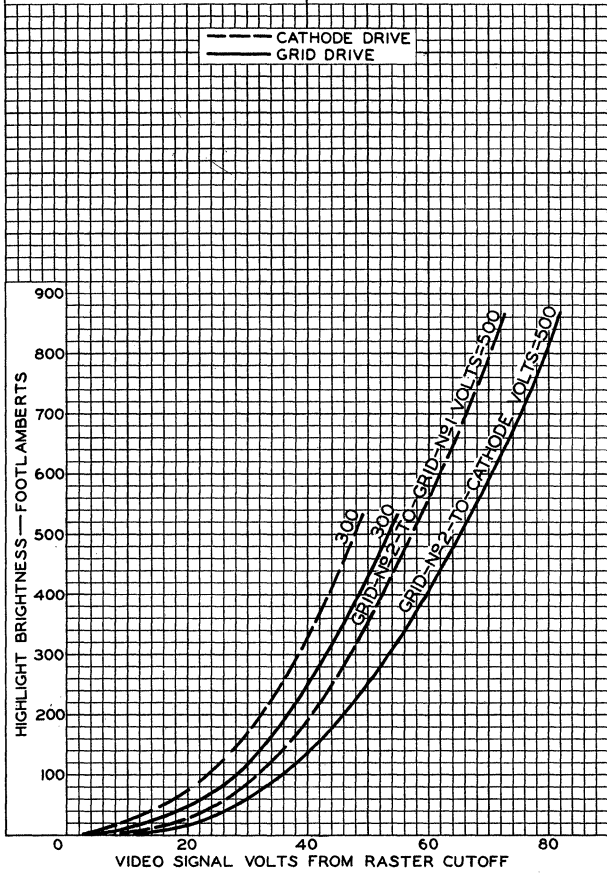
17DSP4



17DSP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
$E_f = 6.3$ VOLTS	$E_f = 6.3$ VOLTS
ULTOR-TO-GRID-N ₁ VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID N ₁ TO GIVE FOCUSED RASTER CUTOFF.	GRID N 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 10 1/2"	RASTER SIZE = 14" x 10 1/2"

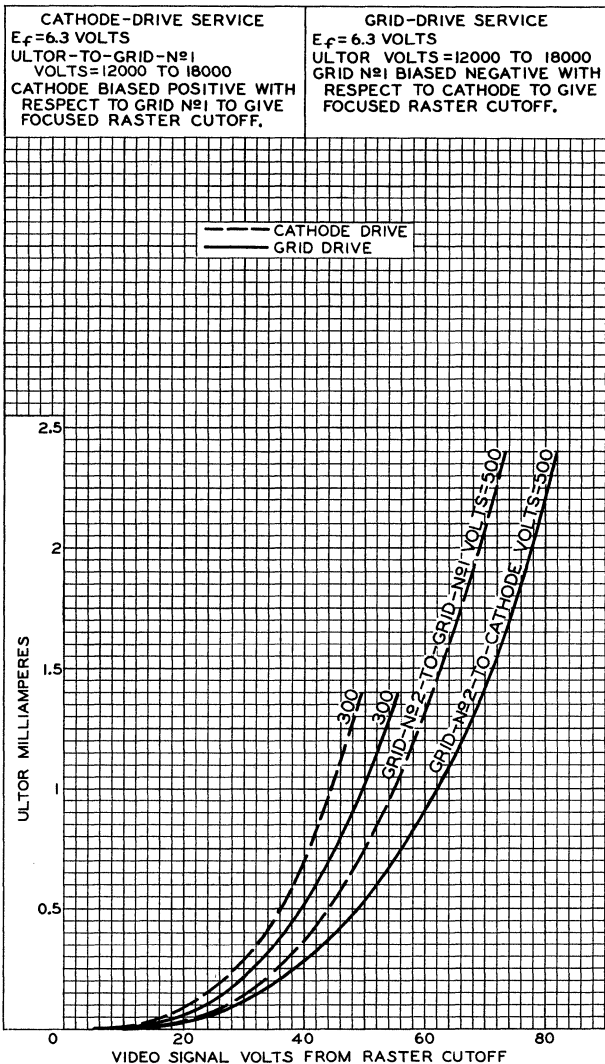




17DSP4

17DSP4

AVERAGE DRIVE CHARACTERISTICS



17DWP4

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
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. { 1500 max. μμf
750 min. μμf
Electron Gun. Type Requiring No Ion-Trap Magnet

Optical:

Faceplate Filterglass
Light transmission (Approx.) 74%
Phosphor (For curves, see front of this section). . P4—Sulfide Type,
Aluminized

Mechanical:

Operating Position. Any
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:

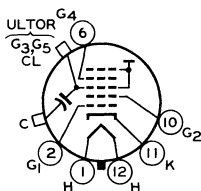
See *Picture-Tube Dimensional-Outlines* and *Bulb J133 B/D* sheets
at the front of this section

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



17DWP4

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



Picture Tube

SHORT RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
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	$\mu\mu\text{f}$
Cathode to all other electrodes	5	$\mu\mu\text{f}$
External conductive coating to ultor. .	{ 1500 max.	$\mu\mu\text{f}$
	{ 1000 min.	$\mu\mu\text{f}$

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" \pm 1/4"

Greatest width. 15-5/8" \pm 1/8"

Greatest height. 12-3/4" \pm 1/8"

Diagonal. 16-9/16" \pm 1/8"

Neck length. 3-9/16" \pm 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/B

Socket. Ucinite Part No. 115446, or equivalent

Base. Small-Button Neoeightar 7-Pin, Arrangement 1,

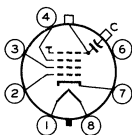
(JEDEC No. B7-208)



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_{c4k}) between 12000 and 16000 volts and grid-No.2 voltage (E_{c2k}) between 400 and 550 volts

Grid-No.3 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.3 Current.	-25 to +25	μ a
Grid-No.2 Current.	-15 to +15	μ a



Field Strength of Adjustable Centering Magnet 0 to 12 gausses

Examples of Use of Design Ranges:

With ultor voltage of	16000	16000	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.	{ 16000 max. 12000 [■] min.	volts
		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. 300 min.	volts
		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_{C4g1}) between 12000 and 16000 volts and grid-No.2-to-grid-No.1 voltage (E_{C2g1}) between 400 and 690 volts

Grid-No.3-to-Grid-No.1 Voltage for focus§. 0 to 400 volts



17DXP4

Cathode-to-Grid-No.1 Voltage ($E_{k_{g1}}$) for visual extinction of focused raster.	See <i>Raster-Cutoff-Range Chart</i> <i>for Cathode-Drive Service</i>
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for $E_{k_{g1}}$ except video drive is a negative voltage
Grid-No.3 Current	-25 to +25 μ a
Grid-No.2 Current	-15 to +15 μ a
Field Strength of Adjust- able Centering Magnet	0 to 12 gauss

Examples of Use of Design Ranges:

<i>With ultor-to-grid-</i> <i>No.1 voltage of</i>	16000	16000	volts
<i>and grid-No.2 to-grid-</i> <i>No.1 voltage of</i>	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.

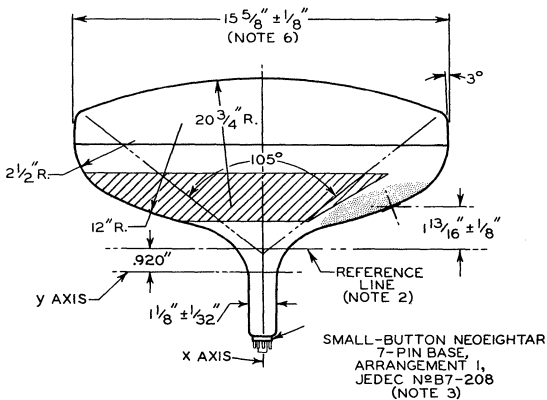
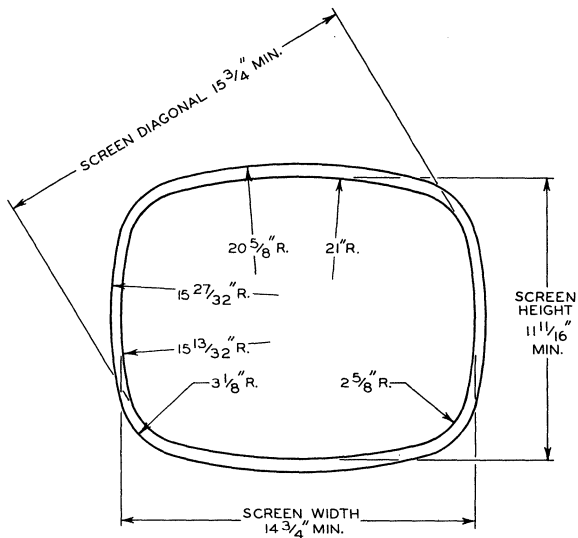
OPERATING CONSIDERATIONS

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.

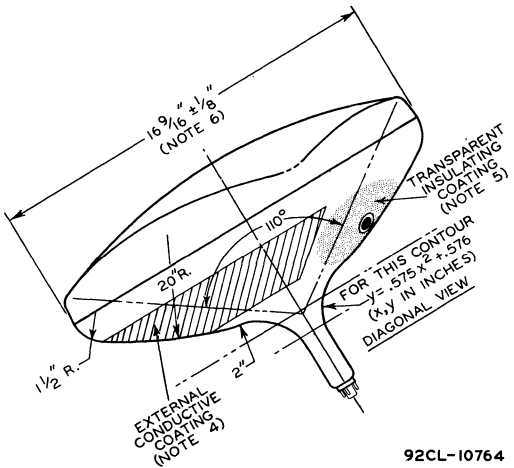
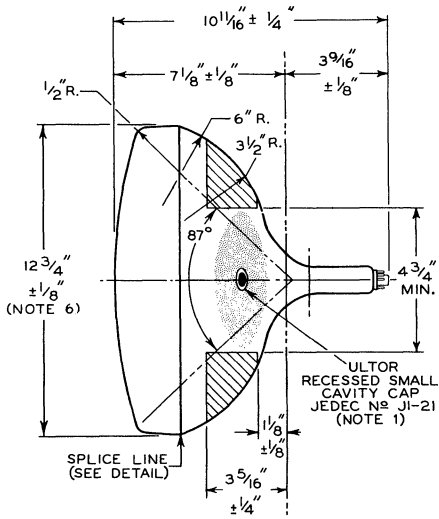
*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*



17DXP4



17DXP4



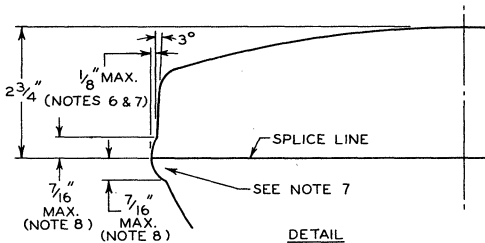
92CL-10764



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

DATA 4
 8-60

17DXP4



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME 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 $1\text{-}\frac{3}{4}$ ".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: MEASURED $2\text{-}\frac{9}{32}$ " \pm $\frac{1}{32}$ " FROM THE PLANE TANGENT TO THE SURFACE OF THE FACEPLATE AT THE TUBE AXIS.

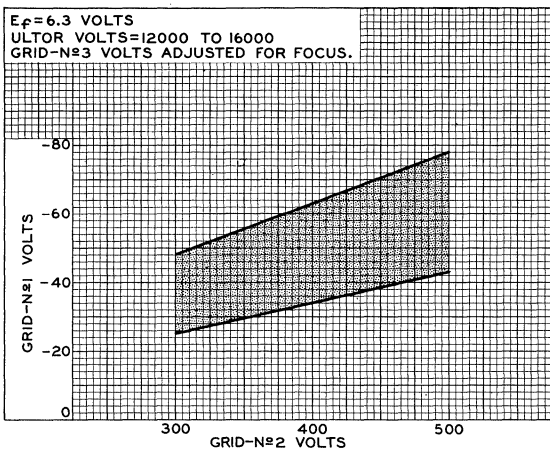
NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN $\frac{1}{4}$ ", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN $\frac{1}{8}$ " BEYOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMENSIONING 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 $2\text{-}\frac{7}{16}$ " FROM REFERENCE LINE.

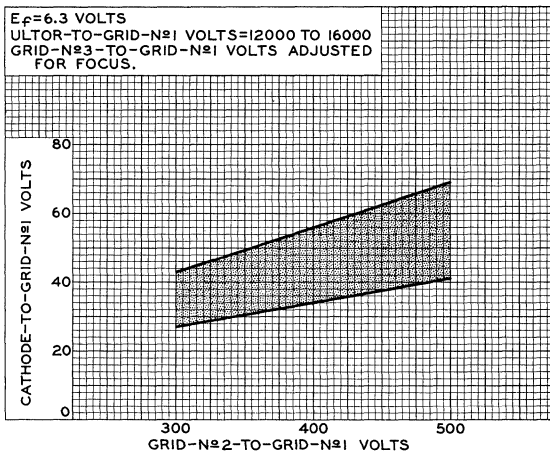
RASTER-CUTOFF-RANGE CHARTS

Grid-Drive Service



92CS-9930

Cathode-Drive Service



92CS-9931





17GP4

PICTURE TUBE

RECTANGULAR METAL-SHELL TYPE

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

17GP4

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"

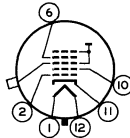
Operating Position Any

Ultor Terminal Metal-Shell Lip

Base . . Small-Shell Duodecal 6-Pin (JETEC Group 4, No.86-63)

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



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*

17HP4B

Picture Tube

RECTANGULAR GLASS TYPE ALUMINIZED SCREEN
 LOW-VOLTAGE ELECTROSTATIC FOCUS 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 $\left\{ \begin{array}{l} 1500 \text{ max.} \\ 750 \text{ min.} \end{array} \right.$ pf
 Heater Current at 6.3 volts. 600 ± 30 ma
 Electron Gun Ion-Trap Type Requiring
 External Single-Field Magnet

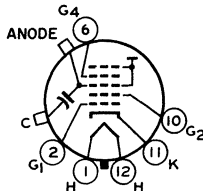
Optical:

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



17HP4B

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.	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



17LP4A

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC 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.	pf
	{ 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, 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:

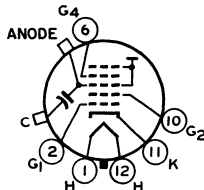
Type	Regular-Band
Contact area for grounding	Near Reference Line

For Additional Information on Coatings and Dimensions:

See *Picture-Tube Dimensional-Outlines and Bulb J133 C/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.86-63)
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



17LP4A

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	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





17QP4-A PICTURE TUBE

17QP4-A

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts
Current $0.6 \pm 10\%$ amp

Capacitance between External Conduc-
tive Coating and Ultor $\left\{ \begin{array}{l} 1500 \text{ max. } \mu\mu\text{f} \\ 750 \text{ min. } \mu\mu\text{f} \end{array} \right.$

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 $19-3/16" \pm 3/8"$
Greatest width $15-25/64" \pm 1/8"$
Greatest height $12-9/32" \pm 1/8"$
Diagonal $16-5/8" \pm 1/8"$
Neck length $7-1/2" \pm 3/16"$
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.

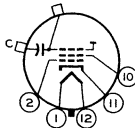
Operating Position Any

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



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

17TP4

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"

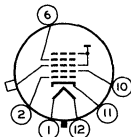
Operating Position Any

Ultor Terminal Metal-Shell Lip

Base . . Small-Shell Duodecal 6-Pin (JETEC Group 4, No.86-63)

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.

17TP4



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*

19ABP4

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. 850 min.	pf
		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	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

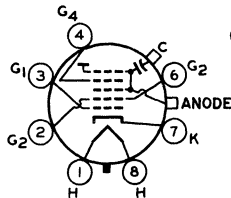
For Additional Information on Coatings and Dimensions:

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.B7-208)

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



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.	volts
	{ 2.4 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	450 max.	volts
After equipment warm-up period.	200 max.	volts
Heater positive with respect to cathode:		
Combined AC and DC voltage.	200 max.	volts
DC component.	100 max.	volts

Typical Operating Conditions for Grid-Drive Service:

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

Anode Voltage	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
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
114° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts.	600 ± 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
		μμf
Electron Gun	Type Requiring No Ion-Trap Magnet	

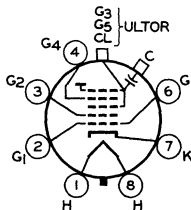
Optical:

Faceplate and Protective Panel	Filterglass
Light transmission (Approx.)	44%
Phosphor (For curves, see front of this section)	P4—Sulfide 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 <i>Picture-Tube Dimensional-Outlines</i> and <i>Bulb J149 C</i> 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
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.	pf
	{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:

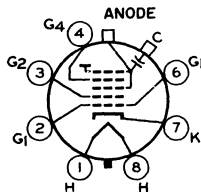
Type. Regular-Band
Contact area for grounding. Near Reference Line
For Additional Information on Coatings and Dimensions:

See *Picture-Tube Dimensional-Outlines and Bulb 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. B7-208)

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
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 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. $\begin{cases} 1900 \text{ max.} \\ 1400 \text{ min.} \end{cases}$ μμf
 Electron Gun. Type Requiring No Ion-Trap Magnet

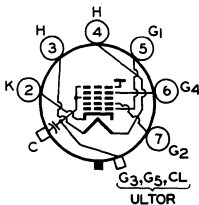
Optical:

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



19ANP4

Picture Tube

SHORT RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
114° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

The 19ANP4 is the same as the 19YP4 except for the following item:

Electrical:

Heater Current at 6.3 volts. 450 ± 5% ma





19AP4-B PICTURE TUBE

ROUND METAL-SHELL TYPE

19AP4-B

MAGNETIC FOCUS

MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage 6.3 ac or dc volts

Current $0.6 \pm 10\%$ amp

Faceplate, Spherical Frosted Filterglass
Phosphor (For curves, see front of this section) . P4—Sulfide Type

Deflection Angle (Approx.) 66°

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

Overall Length $21\text{-}1/2" \pm 1/2"$

Greatest Diameter of Bulb $18\text{-}5/8" \pm 1/8"$

Minimum Useful Screen Diameter $17\text{-}1/4"$

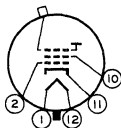
Operating Position Any

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

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*

← Indicates a change.

④

⑤

⑥

⑦

⑧

⑨

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.	pf
	{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

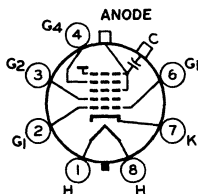
For Additional Information on Coatings and Dimensions:

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.	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	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
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts.	600 ± 30	ma
Heater Warm-Up Time (Average).	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	μf
Cathode to all other electrodes.	5	μf
External conductive coating to ultor.	{1500 max. 1000 min.	{μf μf
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	

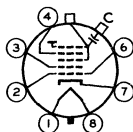


19AVP4

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_{c5k}) of	20000	volts
and grid-No. 2 voltage (E_{c2k}) 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-DRIVE¹ 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.	volts
	{ 15000 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.	{ 700 max.	volts
	{ 350 min.	volts
	550 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.		
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 (E_{c5g1}) of	20000	volts
and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) of	400	volts
Grid-No.4-to-Grid-No.1 Voltage for focus ²	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster ³	36 to 78	volts
Field Strength of Adjustable Centering Magnet ⁴	0 to 9	gausses

Maximum Circuit Values:

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

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

² 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.

³ See Raster-Cutoff-Range Chart for Grid-Drive Service.

⁴ Distance from Reference Line for suitable PM centering magnet should not exceed 2-1/4". The specified centering magnet compensates only for the effect which mechanical tube tolerances may have on the location of the undeflected focused spot with respect to the center of the tube face. Maximum field strength of adjustable centering magnet equals:



19AVP4

$$\sqrt{\frac{E_{c5k} \text{ or } E_{c591} \text{ (volts)}}{16000 \text{ (volts)}}} \times 8 \text{ gaussess}$$

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.*

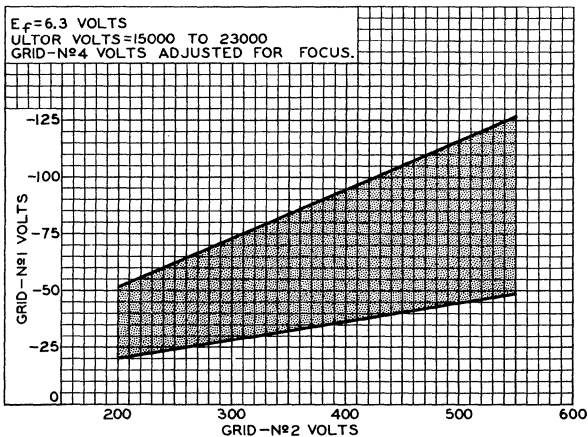
OPERATING CONSIDERATIONS

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.

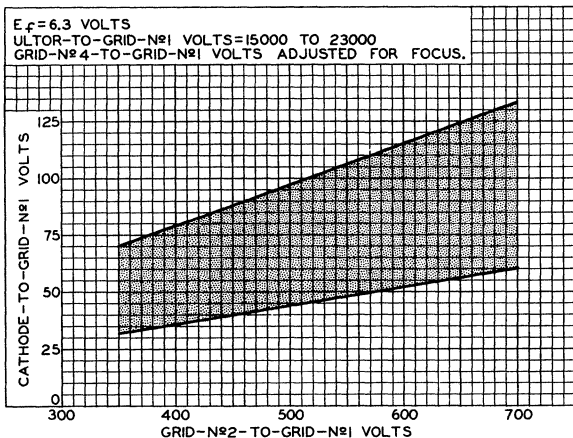


RASTER-CUTOFF-RANGE CHARTS Grid-Drive Service



92CS-10790

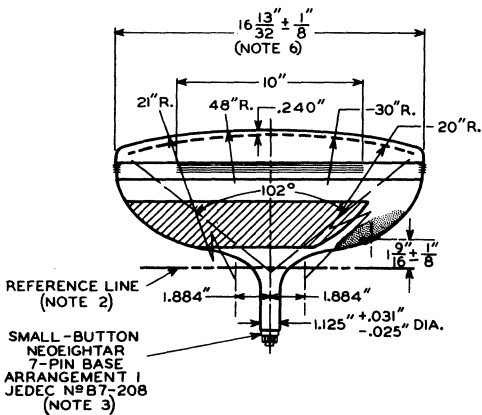
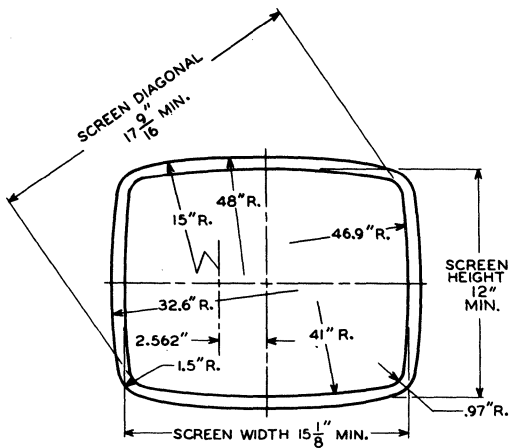
Cathode-Drive Service

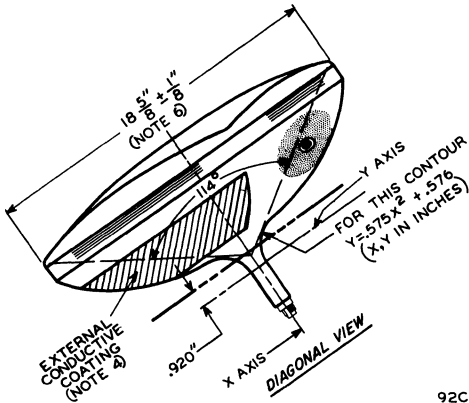
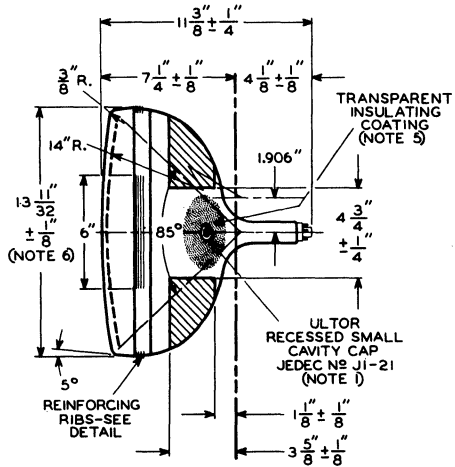


92CS-10819



19AVP4

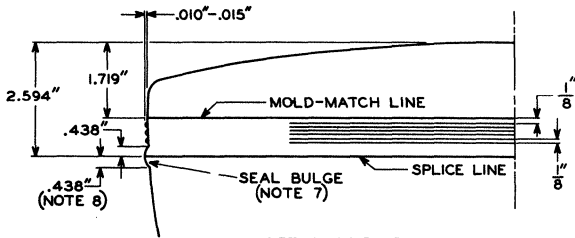




92CL-10670RI



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 $\pm 30^\circ$. 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 GROUNDING.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: MEASURED AT THE MOLD-MATCH LINE.

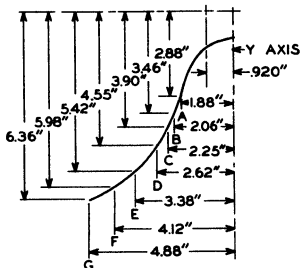
NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN $1/8''$, BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN $1/16''$ BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

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 SPEC'ED FROM THE TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

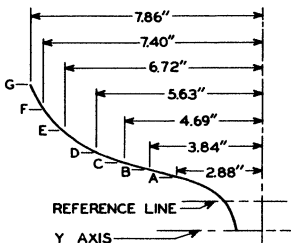


BULB-CONTOUR DIMENSIONS

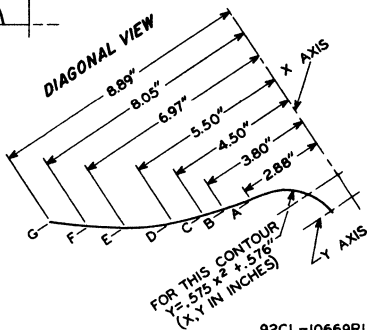
SHORT-SIDE VIEW



LONG-SIDE VIEW



DIAGONAL VIEW



92CL-10669RI

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.



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	

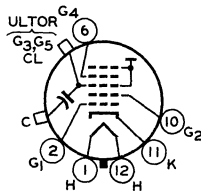
Optical:

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 <i>Picture-Tube Dimensional-Outlines</i> and <i>Bulb J149 B</i> 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:

<i>With ultor-to-grid-No.1 voltage of</i>	<i>14500</i>	<i>volts</i>
<i>and grid-No.2-to-grid-No.1 voltage of</i>	<i>50</i>	<i>volts</i>
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



19BFP4

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
92° MAGNETIC DEFLECTION

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 5%	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.	} 2000 max. μμf 1500 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.).	14-3/4 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):

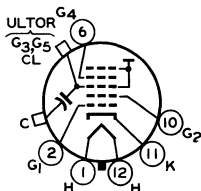
 Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No. B6-203)

 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



19BFP4

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 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	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

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



1

2

3

4

5

6

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	μf
Cathode to all other electrodes	5	μf
External conductive coating to ultor.	{ 1500 max. 1000 min.	{ μf μf
Electron Gun.	Type Requiring No Ion-Trap Magnet	

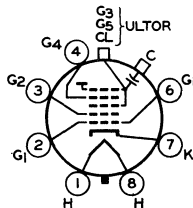
Optical:

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 <i>Picture-Tube Dimensional-Outlines</i> and <i>Bulb J149 A</i> 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



19CHP4

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



19CKP4

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:

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
	{1000 min.	pf
Heater Current at 6.3 volts.	600 \pm 30	ma
Heater Warm-Up Time (Average).	11	seconds
Electron Gun	Type Requiring No Ion-Trap Magnet	

Optical:

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

Mechanical:

Weight (Approx.) 14 lbs
Overall Length 11-3/4" \pm 1/4"
Neck Length. 4-1/2" \pm 1/8"
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:

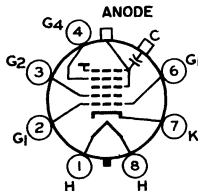
See *Picture-Tube Dimensional-Outlines and Bulb J149 A* sheets
at front of this section

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

Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)
7-Pin (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



19CKP4

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	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE.	{ 100 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 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.	0 to 500	volts
Grid-No.2 Voltage.	50	volts
Cathode Voltage for visual extinction of focused raster	31 to 49	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
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	μmf
Cathode to all other electrodes.	5	μmf
External conductive coating to ultor	{1500 max. 1000 min.	{μmf μmf
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.

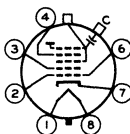


19XP4

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^A 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_4k}) 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.	<i>See Raster-Cutoff-Range Chart for Grid-Drive Service</i>	



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	gausses

Examples of Use of Design Ranges:

<i>With ultor voltage of</i>	16000	volts
<i>and grid-No.2 voltage of</i>	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-Maximum Values:

ULTOR-TO-GRID-No.1 VOLTAGE	{	20000 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	{	700 max.	volts
		350 min.	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.	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



19XP4

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 (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	μ a
Grid-No.2 Current	-15 to +15	μ a
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 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.



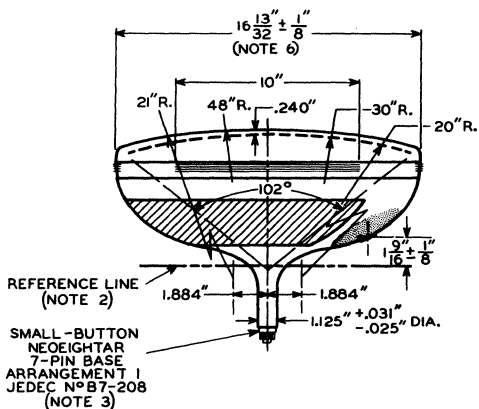
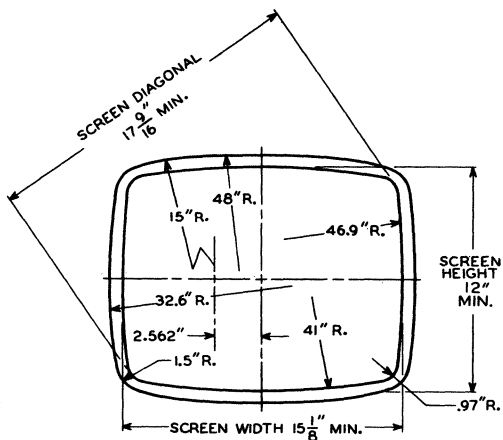
OPERATING CONSIDERATIONS

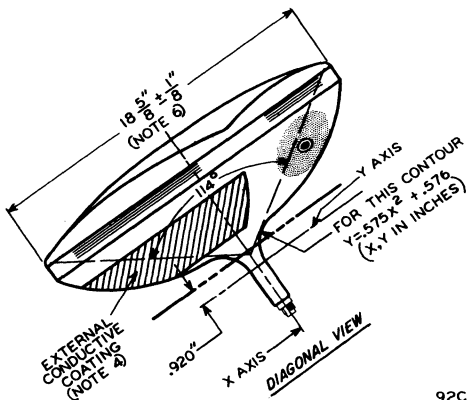
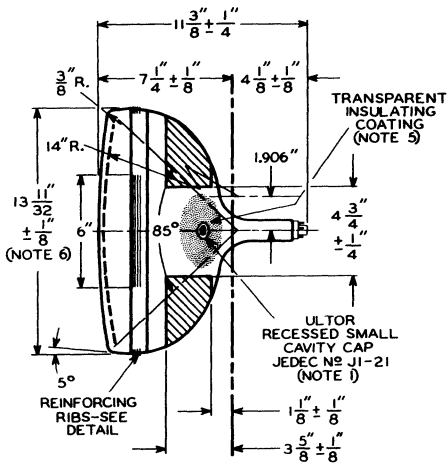
X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, this picture tube does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 20 kilovolts (Design-maximum value), shielding of this picture tube for X-ray radiation 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

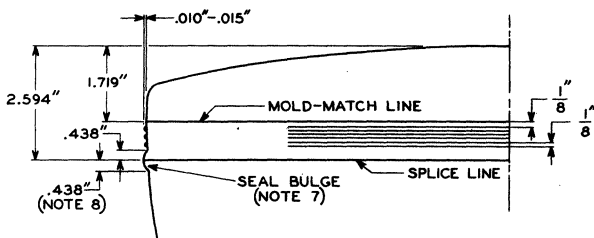




92CL-10670RI



19XP4



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 $\pm 30^\circ$. 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.

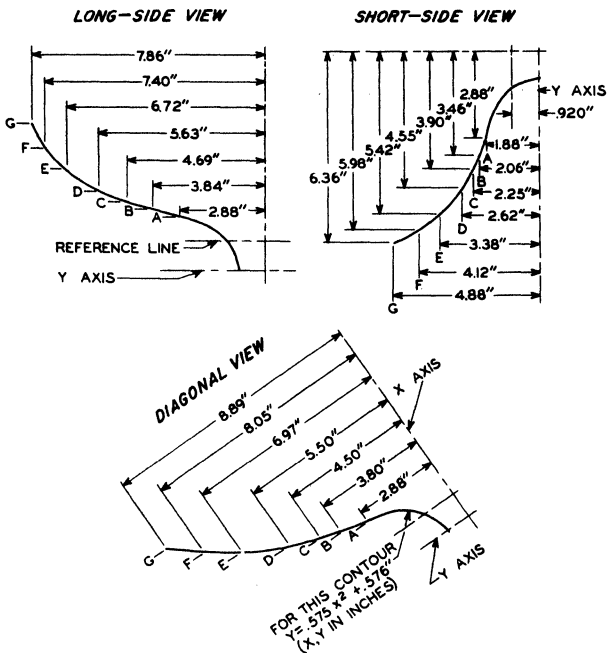
NOTE 6: MEASURED AT THE MOLD-MATCH LINE.

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

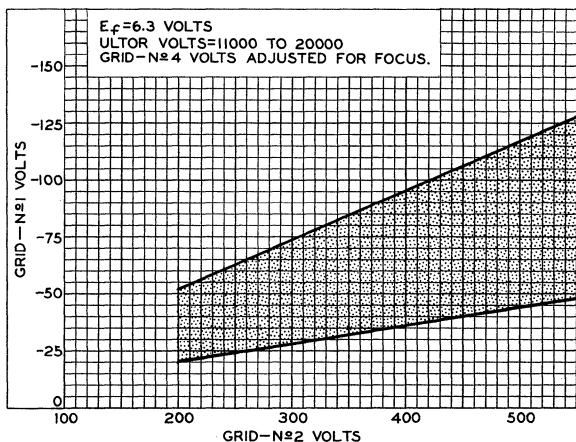


92CL-10669RI

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.

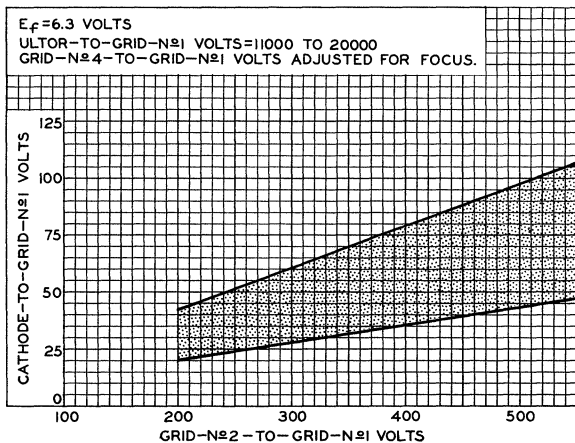


RASTER-CUTOFF-RANGE CHARTS Grid-Drive Service



92CS-10640

Cathode-Drive Service



92CS-10641

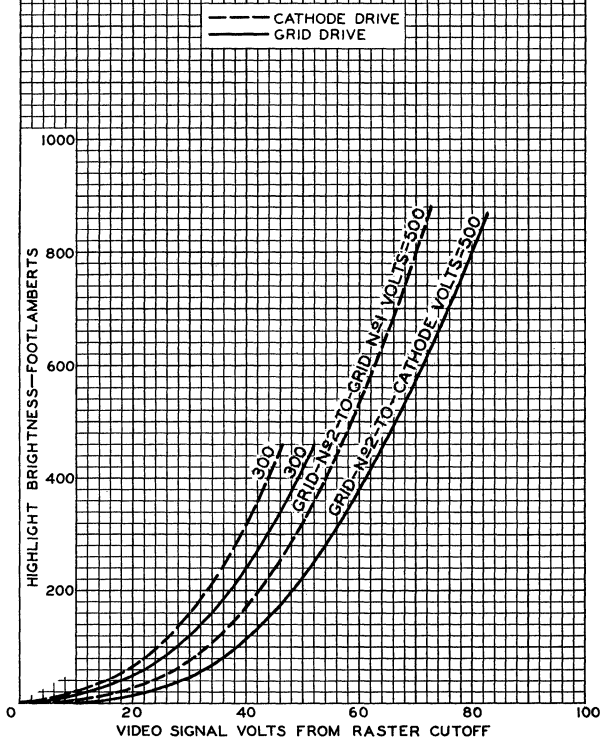


AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE
 $E_f = 6.3$ VOLTS
 ULTOR-TO-GRID-N₂ VOLTS = 16000
 CATHODE BIASED POSITIVE WITH
 RESPECT TO GRID N₂ TO GIVE
 FOCUSED RASTER CUTOFF.
 RASTER FOCUSED
 AT AVERAGE BRIGHTNESS.
 RASTER SIZE = 14" x 10 1/2"

GRID-DRIVE SERVICE
 $E_f = 6.3$ VOLTS
 ULTOR VOLTS = 16000
 GRID N₂ BIASED NEGATIVE WITH
 RESPECT TO CATHODE TO GIVE
 FOCUSED RASTER CUTOFF.
 RASTER FOCUSED
 AT AVERAGE BRIGHTNESS.
 RASTER SIZE = 14" x 10 1/2"

CIE COORDINATES OF SCREEN: X = 0.287, Y = 0.315



92CM-10647RI



19XP4

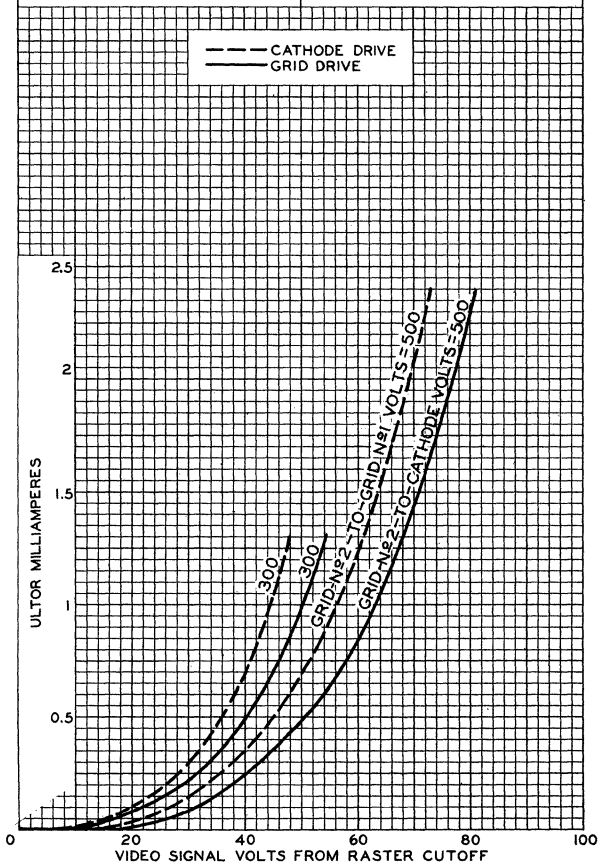
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE

$E_f = 6.3$ VOLTS
ULTOR-TO-GRID- $N^{\circ}1$
VOLTS = 11000 TO 20000
CATHODE BIASED POSITIVE WITH
RESPECT TO GRID $N^{\circ}1$ TO GIVE
FOCUSED RASTER CUTOFF.

GRID-DRIVE SERVICE

$E_f = 6.3$ VOLTS
ULTOR VOLTS = 11000 TO 20000
GRID $N^{\circ}1$ BIASED NEGATIVE WITH
RESPECT TO CATHODE TO GIVE
FOCUSED RASTER CUTOFF.



92CM-10643



Picture Tube

SHORT RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts.	600 ± 30	ma
Heater Warm-Up Time (Average).	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	μf
Cathode to all other electrodes.	5	μf
External conductive coating to ultor	{ 1500 max. 1000 min.	{ μf μf
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

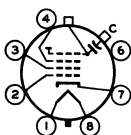
Pin 2 - Grid No.1

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^A 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_{c4k}) of	16000	volts
and grid-No.2 voltage (E_{c2k}) 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	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.	{ 20000 max.	volts
	{ 11000 min.	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.	volts
	{ 450 min.	volts
	600 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.		
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 (E_{c4g1}) of	16000	volts
and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) 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



19YP4

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 2-1/4". 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:

$$\sqrt{\frac{E_{C4k} \text{ or } E_{C4g1} \text{ (volts)}}{16000 \text{ (volts)}}} \times 10 \text{ gaussess}$$

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.

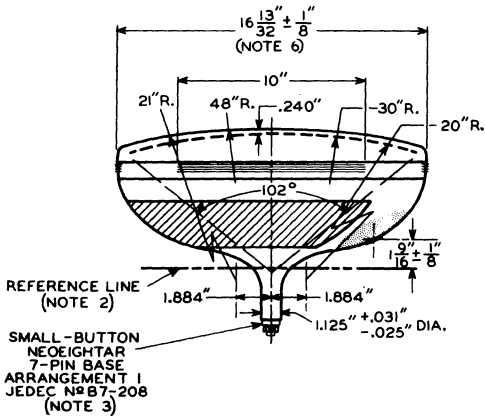
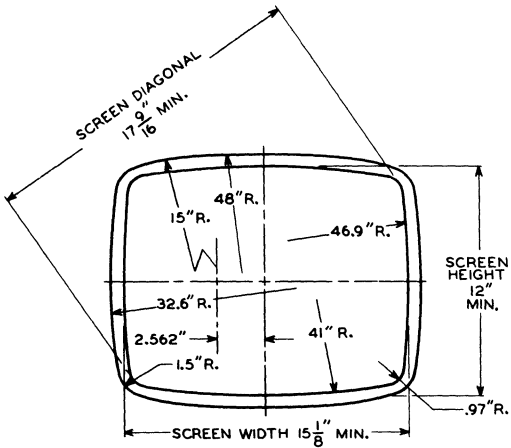
◆ See *Raster-Cutoff-Range Chart for Cathode-Drive Service.*

OPERATING CONSIDERATIONS

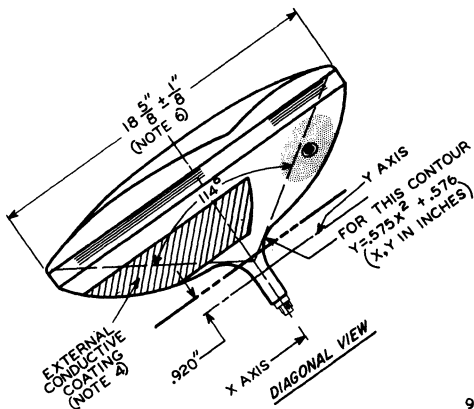
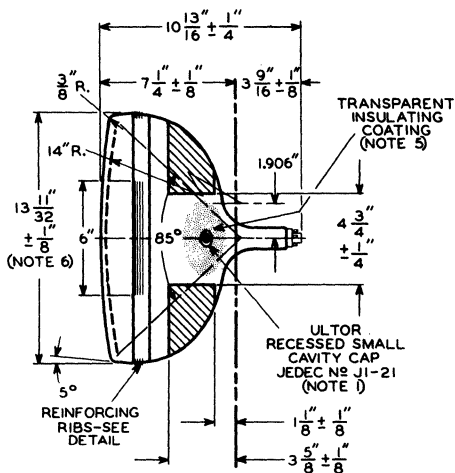
X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, this picture tube does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 20 kilovolts (Design-maximum value), shielding of this picture tube for X-ray radiation 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.



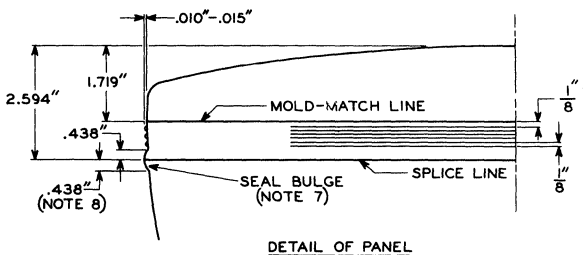


19YP4



92CL-10699





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 $\pm 30^\circ$. 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.

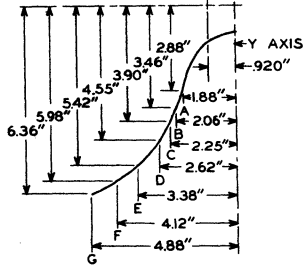
NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

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.

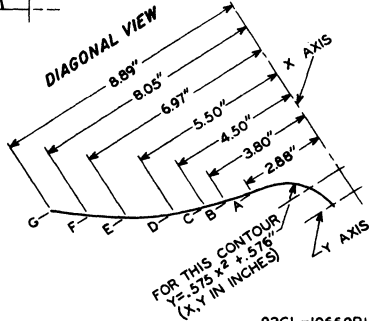
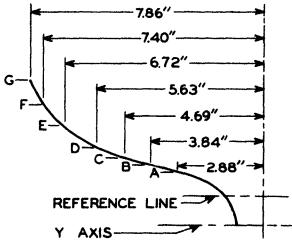


BULB-CONTOUR DIMENSIONS

SHORT-SIDE VIEW



LONG-SIDE VIEW

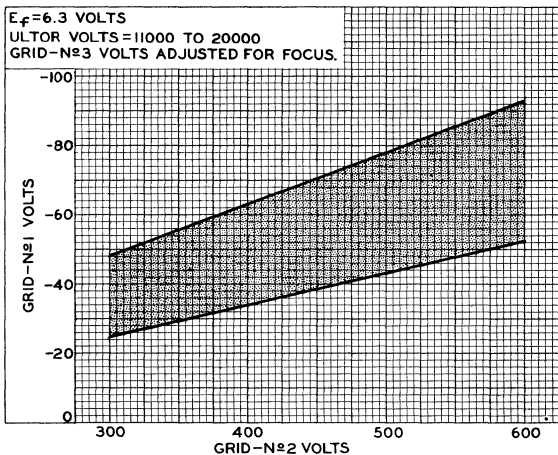


92CL-10669R1

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.

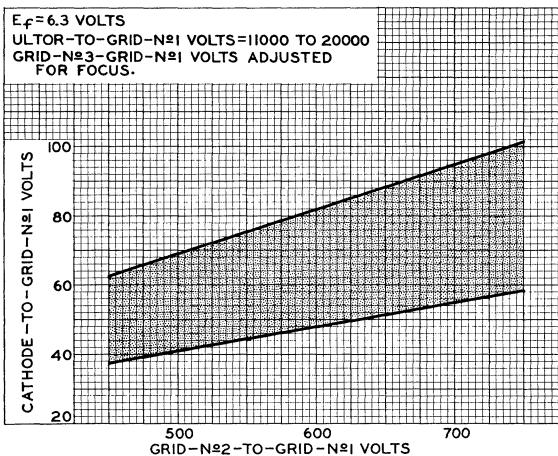


RASTER-CUTOFF-RANGE CHARTS Grid-Drive Service



92CS-10789

Cathode-Drive Service



92CS-10818



20DP4C

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. 500 min.	pf
		ma
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.). 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:

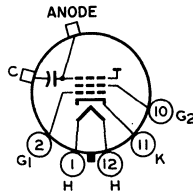
Type. Regular-Band
Contact area for grounding. Near Reference Line

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



20DP4C

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	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



20HP4D

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
70° MAGNETIC DEFLECTION

GENERAL DATA

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. pf 500 min. pf	
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.). 75%

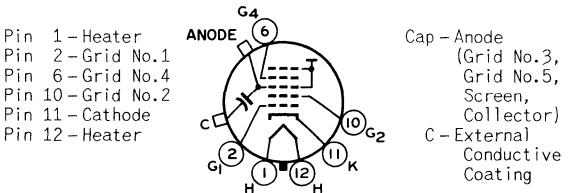
Mechanical:

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



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



20HP4D

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.	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	-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





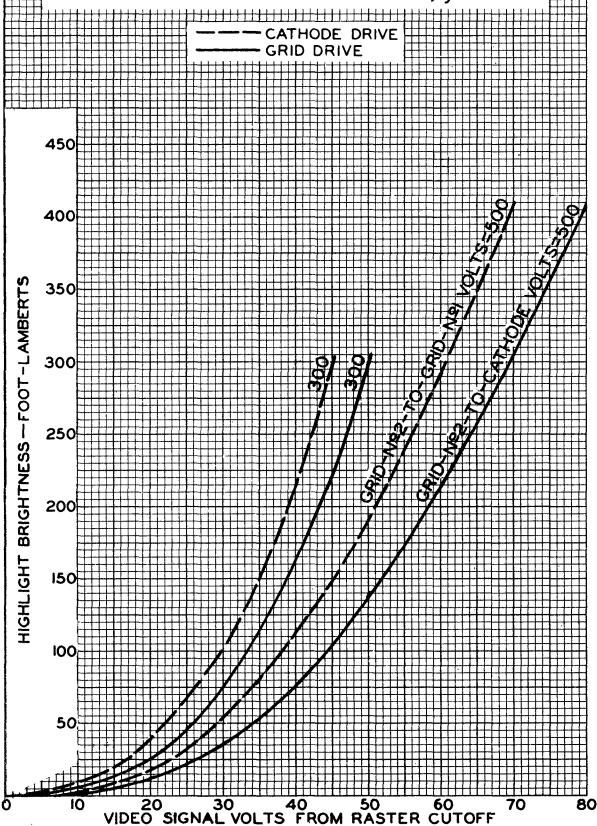
2IACP4-A

2IACP4-A/2IBSP4/2IAMP4-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 = 18" x 13 1/2"	RASTER SIZE = 18" x 13 1/2"

I.C.I. COORDINATES OF SCREEN: $x=0.2890$, $y=0.3260$

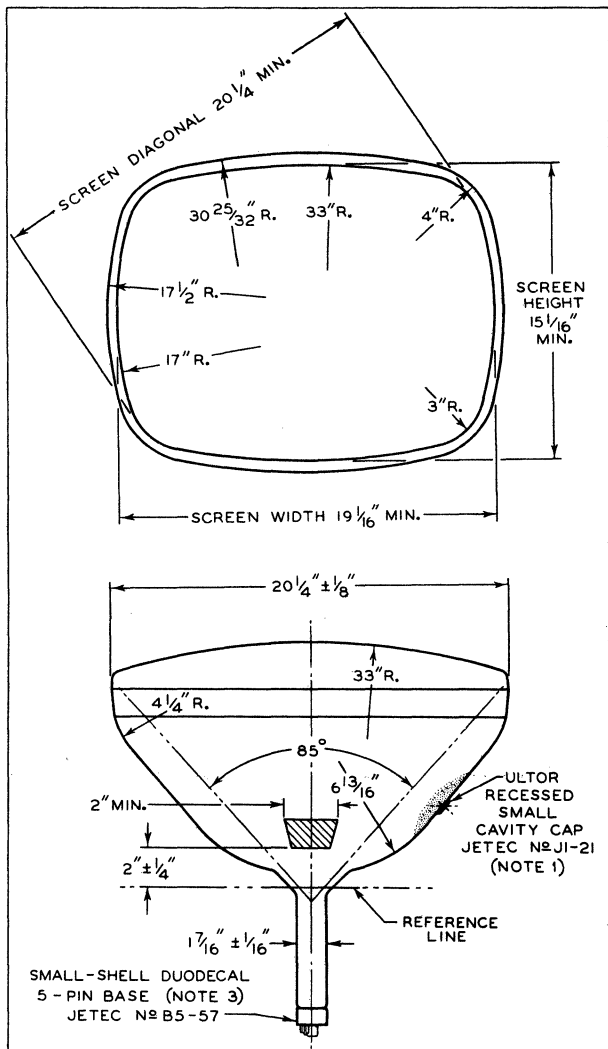


2IACP4-A



2IACP4-A/2IBSP4/2IAMP4-A

PICTURE TUBE



21AMP4A

Picture Tube

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
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 μf
Cathode to all other electrodes 5 μf
External conductive coating to ultor. $\left\{ \begin{array}{l} 2500 \text{ max. } \mu\text{f} \\ 2000 \text{ min. } \mu\text{f} \end{array} \right.$
Electron Gun. Ion-Trap Type Requiring
External Single-Field Magnet

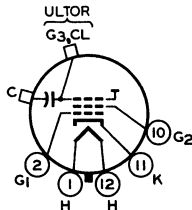
Optical:

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" \pm 3/8"
Neck Length 7-1/2" \pm 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 and Dimensions:
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—Ultor
(Grid No.3,
Collector)
C—External
Conductive
Coating



21AMP4A

Maximum Ratings, Design-Maximum Values:

ULTOR 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
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.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





21AP4

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. $0.6 \pm 10\%$ 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. $19-23/32" \pm 1/8"$

Greatest height at lip $15-5/16" \pm 1/8"$

Diagonal at lip. $20-3/4" \pm 1/4"$

Neck length. $7-1/2" \pm 3/16"$ ←

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" ←

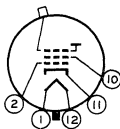
Operating Position Any

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



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*

21AVP4B

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
72° MAGNETIC DEFLECTION

GENERAL DATA

Electrical:

Heater Current at 6.3 volts 600 ma
Direct Interelectrode Capacitances:
Grid No.1 to all other electrodes 6 $\mu\mu\text{f}$
Cathode to all other electrodes 5 $\mu\mu\text{f}$
External conductive coating to ultor. $\left\{ \begin{array}{l} 2500 \text{ max. } \mu\mu\text{f} \\ 2000 \text{ min. } \mu\mu\text{f} \end{array} \right.$
Electron Gun. Ion-Trap Type Requiring External Single-Field 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. 23-1/32" \pm 3/8"
Neck Length 7-1/2" \pm 3/16"
Projected Area of Screen. 262 sq. in.

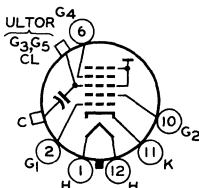
External Conductive Coating:

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



21AVP4B

Maximum Ratings, Design-Maximum Values:

ULTOR 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 ultor 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





21AWP4

PICTURE TUBE

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

21AWP4

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp

Capacitance between External Conduc- tive 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	72°
Horizontal	67°
Vertical	53°

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

Tube Dimensions:

Overall length	23-1/32" ± 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. ←

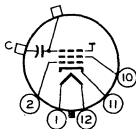
Operating Position Any

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	18000 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.

21AWP4



21AWP4 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*



21AXP22-A

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	μf
Cathode of blue gun + cathode of green		
gun + cathode of red gun to all		
other electrodes	16	μf
Grid No.3 (Of each gun tied within		
tube to No.3 grids of other two		
guns) to all other electrodes.	9	μf
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)	

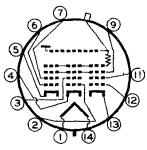
2IAXP22-A



2IAXP22-A COLOR KINESCOPE

Ultor Terminal. Metal Shell
 Base. . . . Small-Shell Neodiheptal 12-Pin (JETEC No. B12-131)
 Socket. Alden Nos. 214NMINS (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_{c4k} 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_{c4k} each gun volts

Grid-No. 2-to-Cathode Voltage (Each gun) when circuit design utilizes grid-No. 1-to-cathode voltage (E_{c1k}) at fixed value for raster cutoff. See Cutoff Design Chart

* , #: See next page.



21AXP22-A

21AXP22-A COLOR KINESCOPE

Grid-No.1-to-Cathode Volt-
age (Each gun) for Visual
Extinction of Focused
Raster when circuit de-
sign utilizes grid-No.2-
to-cathode voltage
(E_{C2k}) at fixed value. See Cutoff Design Chart

Variation in Raster
Cutoff Between Guns
in Any Tube. $\pm 21\%$ of average of highest
and lowest cutoff values

Grid-No.3 Current for ultor
current of 800 μ amp. -45 to +75 μ amp

Grid-No.2 Current (Each gun) . . . -5 to +5 μ amp

Percentage of Total Ultor Current
Supplied by Each Gun:

To produce Illuminant-C White
(I.C.I. Coordinates
 $x = 0.310, y = 0.316$):

Red gun.	47 to 67	per cent
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. Coordin-
ates $x = 0.287, y = 0.316$):

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 re-
spect to phosphor dot at
position of max. displace-
ment (i.e., edge of screen)

Tangential	$\pm 0.0005"$ to $\pm 0.007"$
Radial	$\pm 0.0005"$ to $\pm 0.005"$

* 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.

21AXP22-A



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.	
<i>Horizontal:</i>	
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%
<i>Vertical:</i>	
Blue pattern—	
Parabola amplitude to provide [▲]	Shift of 0 to 1/8"

[ⓐ], [ⓑ], [†], [▲], [∞]: See next page.



21AXP22-A

21AXP22-A COLOR KINESCOPE

For dynamic convergence† (Cont'd):

Vertical:

Sawtooth amplitude to provide^{oo} 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^{oo} . . . 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:

	<i>For ultor voltage of</i>	20000	25000	<i>volts</i>
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.

⊕, †, ▲, oo: See next page.

21AXP22-A



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 (⊙).

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

† Indicated values apply when RCA test yoke is used with the 21AXP22-A.

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

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

X-RAY WARNING

X-ray radiation is produced by the 21AXP22-A when it is operated at its normal ultor voltage. The radiation is through the faceplate, and is sufficient to require the adoption of safety measures in TV receivers. Shielding such as that provided by a 1/4-inch thickness of safety glass (lime) in front of the faceplate, should prove adequate to provide protection against personal injury from prolonged exposure at close range when the tube is operated at its maximum ultor voltage rating.

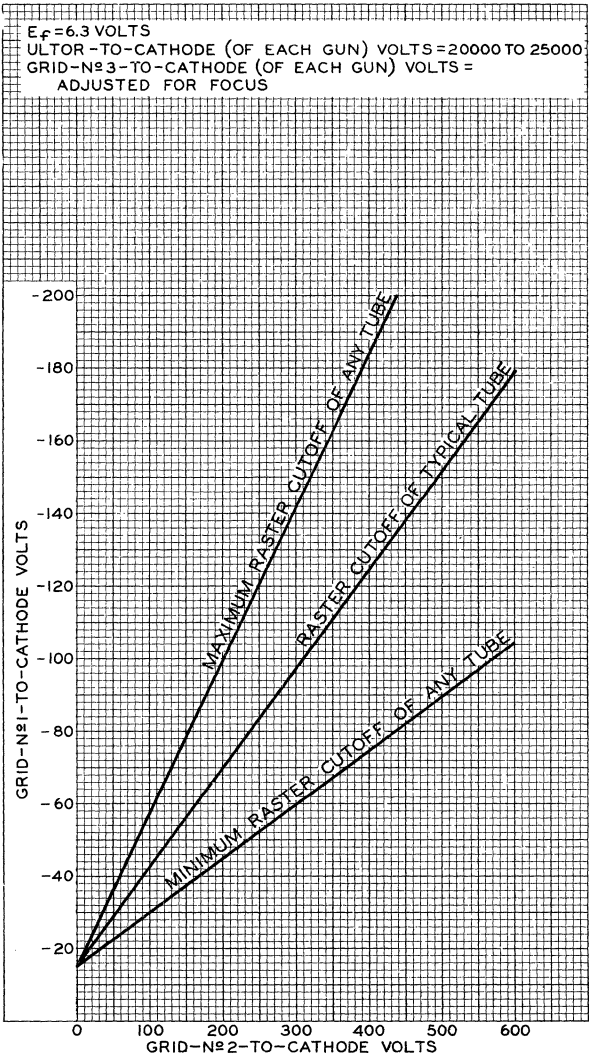
When this tube is being serviced outside of the TV receiver cabinet, it should never be operated without providing adequate X-ray shielding in front of faceplate. Because the ultor voltage may rise above its maximum rated value for short periods during adjustment with increase in the amount of X-ray radiation, provision should be made for placing a 3/8-inch thickness of safety glass in front of the faceplate to avoid the hazard of X-ray radiation.



2IAXP22-A

CUTOFF DESIGN CHART

2IAXP22-A



TUBE DIVISION

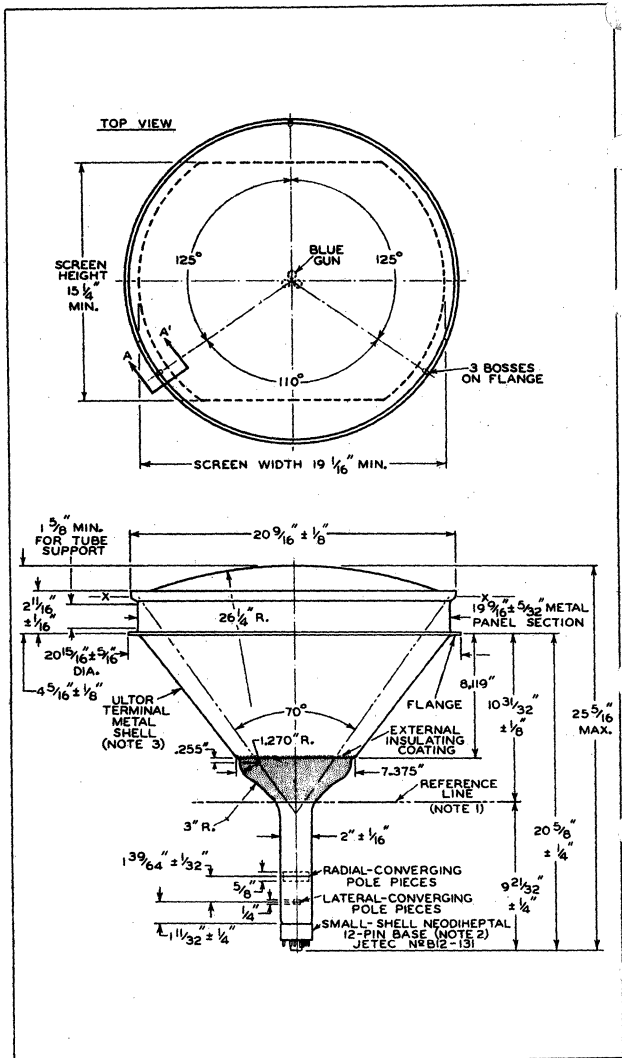
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8565RI

21AXP22-A



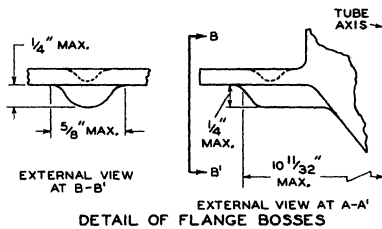
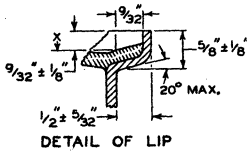
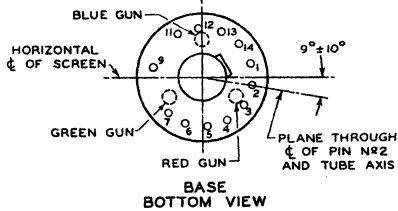
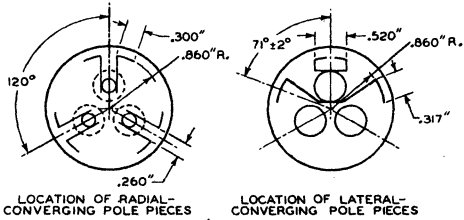
21AXP22-A COLOR KINESCOPE





21AXP22-A

21AXP22-A COLOR KINESCOPE



92CL-8399R4

21AXP22-A



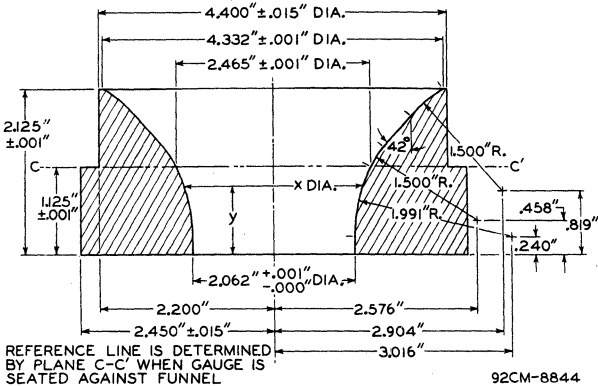
21AXP22-A COLOR KINESCOPE

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" $\begin{matrix} + 0.001'' \\ - 0.000'' \end{matrix}$	0.385"	2.062" $\begin{matrix} + 0.001'' \\ - 0.000'' \end{matrix}$
0.125"	2.062" $\begin{matrix} + 0.001'' \\ - 0.000'' \end{matrix}$	0.500"	2.084" $\pm 0.001''$
0.250"	2.062" $\begin{matrix} + 0.001'' \\ - 0.000'' \end{matrix}$	0.625"	2.122" $\pm 0.001''$
0.375"	2.062" $\begin{matrix} + 0.001'' \\ - 0.000'' \end{matrix}$	0.750"	2.182" $\pm 0.001''$



21AXP22-A

21AXP22-A COLOR KINESCOPE

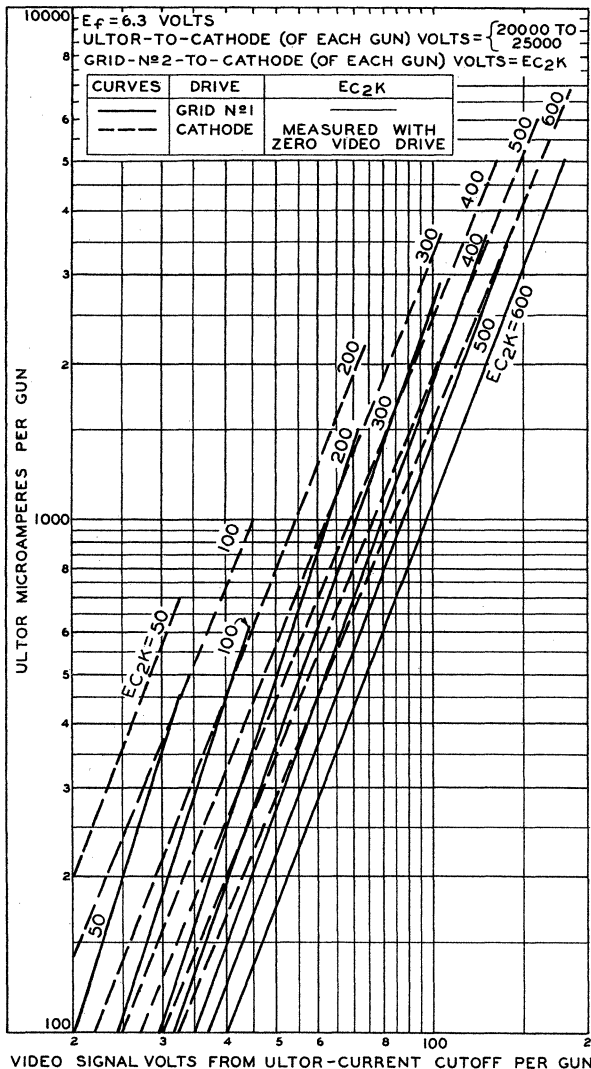
y	x	y	x
0.875"	2.258" ± 0.001"	1.625"	3.216" ± 0.001"
1.000"	2.352" ± 0.001"	1.750"	3.440" ± 0.001"
1.125"	2.465" ± 0.001"	1.875"	3.678" ± 0.001"
1.250"	2.604" ± 0.001"	2.000"	3.958" ± 0.001"
1.375"	2.778" ± 0.001"	2.125"	4.332" ± 0.001"
1.500"	2.990" ± 0.001"		

2IAXP22-A



2IAXP22-A

TYPICAL DRIVE CHARACTERISTICS





21AXP22-A

21AXP22-A

TYPICAL LIGHT-OUTPUT CHARACTERISTICS

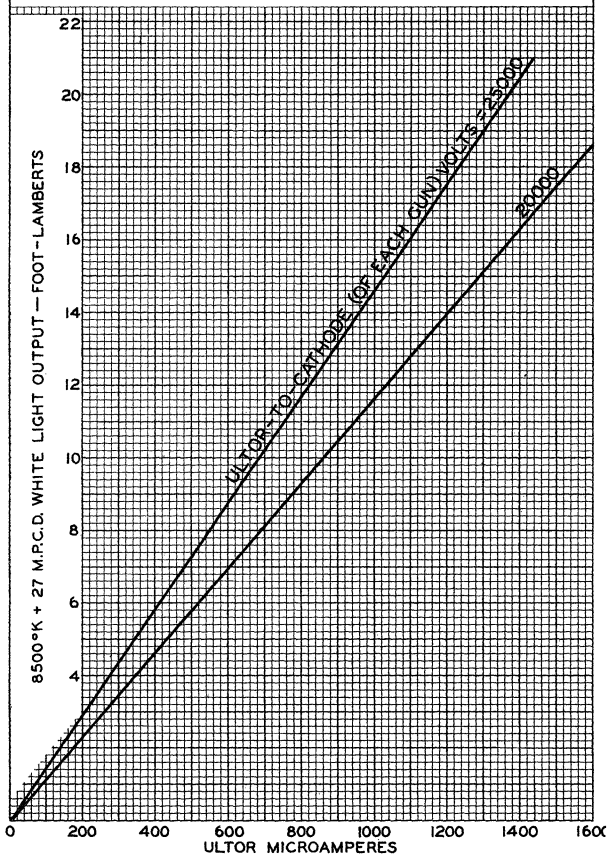
$E_f = 6.3$ VOLTS

GRID-N#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: $19\frac{1}{16}'' \times 14\frac{1}{2}''$



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8426R3



21AXP22-A

21AXP22-A/21AXP22 COLOR PICTURE TUBE

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

ALUMINIZED TRICOLOR PHOSPHOR-DOT SCREEN
Replacement for Types 21AXP22 & 21AXP22-A

DATA

General:

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

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 $1.8 \pm 10\%$ amp

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. . . Red, Blue, Green
Persistence of group phosphorescence. Medium
Dot arrangement Triangular group consisting of
red dot, blue dot, and green 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" \pm 1/8"
At flange 20-15/16" \pm 5/16"

Weight (Approx.) 28 lbs

Operating Position. Tube axis horizontal
(Base pin 12 on top)

Ultor Terminal. Metal Shell
Socket. Alden Nos. 214NMINS (Radial leads),
214NMINC (Axial leads), or equivalent

♦ For Curves, see front of this Section.

21AXP22-A



21AXP22-A/21AXP22 COLOR PICTURE TUBE

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

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



Maximum Ratings, Design-Center Values:

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

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 50,000 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.

Low-Voltage Circuits:

Grid-No.1-Circuit Resistance (Each gun) . . . 1.5 max. megohms



21AXP22-A

21AXP22-A/21AXP22 COLOR PICTURE TUBE

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.

X-RAY WARNING

X-ray radiation is produced by the 21AXP22-A/21AXP22 when it is operated at its normal ultor voltage. The radiation is through the faceplate, and is sufficient to require the adoption of safety measures in television 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 television 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.

21CBP4A

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

ULTOR VOLTAGE	22000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value.	1000 max.	volts
Negative value.	500 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.	200 max.	volts

Typical Operating Conditions:

<i>With ultor voltage of</i>	16000	volts
<i>and grid-No.2 voltage of</i>	300	volts
Grid-No.4 Voltage for focus	0 to 450	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





21CQP4 PICTURE TUBE

21CQP4

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.	μμf
	{ 2000 min.	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.

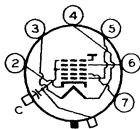
Operating Position Any

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



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*



21CYP22

COLOR PICTURE TUBE

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

ALL-GLASS ENVELOPE
MAGNETIC CONVERGENCE

ELECTROSTATIC FOCUS
MAGNETIC DEFLECTION

21CYP22

DATA

General:

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

Heater, for Unipotential Cathode of
 Each Gun, Paralleled with Each
 the Other Two Heaters within Tube:
 Voltage. 6.3 ac or dc volts
 Current. $1.8 \pm 10\%$ 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	μf
Cathode of blue gun + cathode of green gun + cathode of red gun to all other electrodes	16	μf
Grid No.3 (Of each gun tied within tube to No.3 grids of other two guns) to all other electrodes.	9	μf
External conductive coating to grid No.6.	{2500 max. 2000 min.	μf μf

Faceplate, Spherical Filterglass
 Light transmission (Approx.) 72%

Screen, on Inner Surface of Faceplate:
 Type Aluminized, Tricolor, Phosphor-Dot
 Phosphor (Three separate phosphors, collectively). P22
 Fluorescence and phosphorescence of
 separate phosphors, respectively Blue, Green, Red
 Persistence of group phosphorescence Medium
 Dot arrangement. Triangular group consisting of
 blue dot, green dot, and red dot
 Spacing between centers of adjacent dot trios (Approx.) 0.029"

Size (Minimum):
 Greatest width 19-1/4"
 Height 15-1/2"
 Projected area 261 sq. in.

Focusing Method. Electrostatic
 Convergence Method Magnetic
 Deflection Method. Magnetic

Deflection Angles (Approx.):
 Horizontal 70°
 Vertical 55°

Tube Dimensions:
 Overall length 25-1/32" \pm 3/8"
 Diameter 20-13/16" \pm 1/8"
 Weight (Approx.) 36-1/2 lbs
 Operating Position Tube Axis Horizontal
 (Base pin 12 and V-grooved panel pad on top)

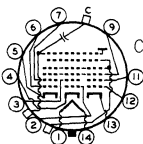
21CYP22



21CYP22

COLOR PICTURE TUBE

Caps (Two)	Recessed Small Cavity (JETEC No. J1-21)
Socket	Alden Nos. 214NMINS (Radial leads), 214NMINC (Axial leads), or equivalent
Base	Small-Shell Neodiheptal 12-Pin (JETEC No. B12-131)
Basing Designation for BOTTOM VIEW	14AL
Pin 1 - Heater	Pin 13 - Cathode
Pin 2 - Grid No. 1 of Red Gun	Pin 14 - Heater
Pin 3 - Grid No. 2 of Red Gun	Cap Over
Pin 4 - Cathode of Red Gun	Pin 1 - Ultor (Grid No. 4, Grid No. 5)
Pin 5 - Cathode of Green Gun	Cap Over
Pin 6 - Grid No. 1 of Green Gun	Pin 2 - Grid No. 6, Collector, High- Voltage- Supply Terminal
Pin 7 - Grid No. 2 of Green Gun	C - External Conductive Coating
Pin 9 - Grid No. 3	
Pin 11 - Grid No. 2 of Blue Gun	
Pin 12 - Grid No. 1 of Blue Gun	

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

ULTOR-TO-CATHODE (Of each gun) VOLTAGE. . . 25000 max. volts
Between the Ultor Terminal and the High-Voltage-Supply Terminal (See *Dimensional Outline*), it is necessary to connect a resistor of 50,000 ohms as described under *Limiting Circuit Values*. The high voltage must be connected to the High-Voltage-Supply Terminal--never directly to the Ultor Terminal.

GRID-No. 3-TO-CATHODE (Of each gun) VOLTAGE. 6000 max. volts

GRID-No. 2-TO-CATHODE VOLTAGE (Each gun) . . 600 max. volts

GRID-No. 1-TO-CATHODE VOLTAGE (Each gun):

Negative bias value 400 max. volts

Positive bias value 0 max. volts

Positive peak value 2 max. volts

PEAK HEATER-CATHODE VOLTAGE (Each gun):

Heater negative with respect to cathode:

During equipment warm-up period

not exceeding 15 seconds. 410 max. volts

After equipment warm-up period. 180 max. volts

Heater positive with respect to cathode . 180 max. volts

Equipment Design Ranges:

With ultor voltage (E_{c4k} each gun) between 20000* and 25000 volts

Grid-No. 3 (Focusing Electrode)-to-Cathode

(Of each gun) Voltage . 16.8% to 20% of E_{c4k} each gun volts

*, #: see next page.



21CYP22

COLOR PICTURE TUBE

21CYP22

Grid-No.2-to-Cathode Voltage (Each gun) when circuit design utilizes grid-No.1-to-cathode voltage (E_{C1k}) at fixed value for raster cutoff. See Cutoff Design Chart

Grid-No.1-to-Cathode Voltage (Each gun) for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2-to-cathode voltage (E_{C2k}) at fixed value. See Cutoff Design Chart

Variation in Raster Cutoff Between Guns in Any Tube. ± 21% of average of highest and lowest cutoff values

Grid-No.3 Current. -45 to +45 μa

Grid-No.2 Current (Each gun) -5 to +5 μa

Percentage of Total Ultor Current Supplied by Each Gun:

To Produce White of 8500° K + 27 M.P.C.D.

(I.C.I. Coordinates

x = 0.287, y = 0.316):

Red gun	50	%
Blue gun	19	%
Green gun	31	%

Ratios of Cathode Currents:

To Produce White of 8500° K + 27 M.P.C.D.

(I.C.I. Coordinates

x = 0.287, y = 0.316):

	Min.	Typical	Max.
Red cathode to green cathode	1	1.6	2
Red cathode to blue cathode	1.5	2.7	4

Maximum Raster Shift in Any Direction from Screen Center[□] 7/8 inch

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

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

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

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

□: See next page.

21CYP22



21CYP22

COLOR PICTURE TUBE

Localized around edge of screen—	
Tangential.	0.002"
Radial.	0.003"

Adjustment to be Provided by
the Following Components:

Lateral-Converging Magnet: [ⓐ]	
Maximum lateral shift of blue beam.	±1/4"
Maximum lateral shift of red beam and green beam.	±1/8" to ±3/8"
Average of maximum lateral shift of red beam and green beam.	±7/32" to ±9/32"

Radial-Converging Magnet Assembly: [ⓑ]	
For static convergence including compensation for dc component of dynamic convergence (Each beam)	Shift of ±5/8"

For dynamic convergence[†]—
Effected by magnetomotive force
of parabolic and/or sawtooth
waveshape synchronized with
scanning.

Horizontal:

Blue pattern—	
Parabola amplitude to provide [▲]	Shift of 3/16" to 1/2"
Sawtooth amplitude to provide ^{ⓄⓄ}	Shift of ±50% of the shift caused by pa- rabola amplitude

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

Difference between red-pattern shift and green-pattern shift (Shift _R - Shift _G)	-75% to +75%
---	--------------

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

ⓐ Shift is the movement of the regions of dot/crosshatch-generator pattern indicated in notes (▲) and (ⓄⓄ).

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

† Indicated values apply when RCA test yoke is used with the 21CYP22.

▲, ⓄⓄ: See next page.



21CYP22

21CYP22

COLOR PICTURE TUBE

Vertical:

- Blue pattern--
 - Parabola amplitude to provide[▲] Shift of -1/8" to +1/16"
 - Sawtooth amplitude to provide[∞] Shift of -1/16" to +3/16"
- Red pattern & green pattern--
 - Parabola:
 - Amplitude to provide[▲] Shift of 1/8" to 5/16"
 - Ratio of red-pattern shift to green-pattern shift 2/3 to 3/2
 - Sawtooth:
 - Amplitude to provide[∞] Shift of -1/8" to +3/16"
 - Difference between red-pattern shift and green-pattern shift (Shift_R - Shift_G) -100% to +100%

Examples of Use of Design Ranges:

<i>For ultor voltage of</i>	<i>20000</i>	<i>25000</i>	<i>volts</i>
Grid-No.3 (Focusing Electrode)-to-Cathode (Of each gun) Voltage. .	3360 to 4000	4200 to 5000	volts
Grid-No.2-to-Cathode Voltage (Each gun) when circuit design utilizes grid-No.1-to-cathode voltage of -70 volts for raster cutoff.	130 to 370	130 to 370	volts
Grid-No.1-to-Cathode Voltage (Each gun) for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2-to-cathode voltage of 200 volts.	-45 to -100	-45 to -100	volts

Limiting Circuit Values:

High-Voltage Circuits:

In order to minimize the possibility of damage to the tube caused by a momentary internal arc, it is recommended that the *high-voltage power supply* and the *grid-No.3 power supply* be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 50

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

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

21CYP22



21CYP22

COLOR PICTURE TUBE

milliamperes. In addition, to prevent cathode damage with resultant decrease in tube life, an external resistor having a value of 50,000 ohms must be connected between the two bulb terminals and the effective resistance between the grid-No.3 power-supply output capacitor and the grid-No.3 electrode should not be less than 50,000 ohms. These resistances should be capable of withstanding the maximum instantaneous currents and voltages in their respective circuits. It is to be noted that the high voltage must be connected only to the High-Voltage-Supply Terminal--*never directly to the Ultor Terminal*. A resistor of 50,000 ohms must be connected between the Ultor Terminal and the High-Voltage-Supply Terminal.

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

Low-Voltage Circuits:

Effective Grid-No.1-to-Cathode-

Circuit Resistance (Each gun). 0.75 max. megohm

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

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

DEFINITIONS

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

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

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

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

GENERAL CONSIDERATIONS

X-Ray Warning. Because the 21CYP22 is designed to be operated at ultor voltages as high as 25 kilovolts (design-center maximum value), shielding of the 21CYP22 for X-ray radiation may be needed to protect against possible injury from prolonged exposure at close range.



21CYP22

COLOR PICTURE TUBE

21CYP22

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 21CYP22 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

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

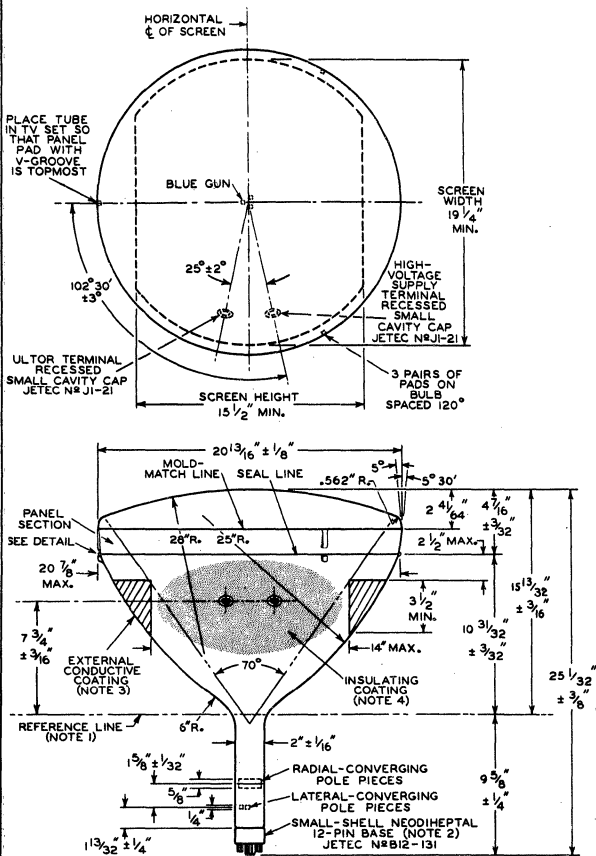
**REFERENCE-LINE AND NECK-FUNNEL-CONTOUR GAUGE
for Type 21CYP22 is the same as that shown for
Type 21AXP22-A**

21CYP22



21CYP22

COLOR PICTURE TUBE

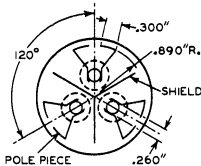




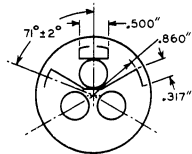
21CYP22

COLOR PICTURE TUBE

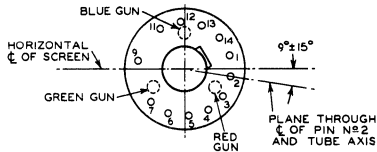
21CYP22



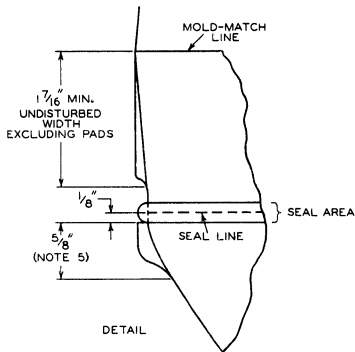
LOCATION OF RADIAL-CONVERGING POLE PIECES VIEWED FROM SCREEN END OF GUNS



LOCATION OF LATERAL-CONVERGING POLE PIECES WITH RESPECT TO GUNS



BASE BOTTOM VIEW



DETAIL

92CL-9340R1

21CYP22



21CYP22

COLOR PICTURE TUBE

NOTE 1: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE AND NECK-FUNNEL-CONTOUR GAUGE AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

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

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

NOTE 4: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

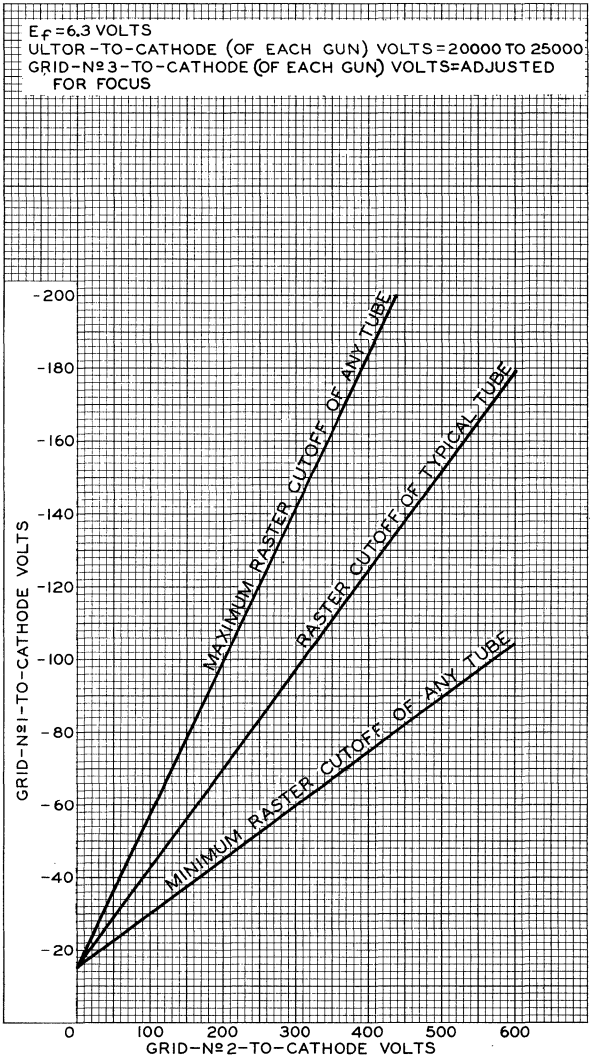
NOTE 5: THE MAXIMUM EFFECTIVE WIDTH OF A FUNNEL PAD IS 5/8".



21CYP22

21CYP22

CUTOFF DESIGN CHART



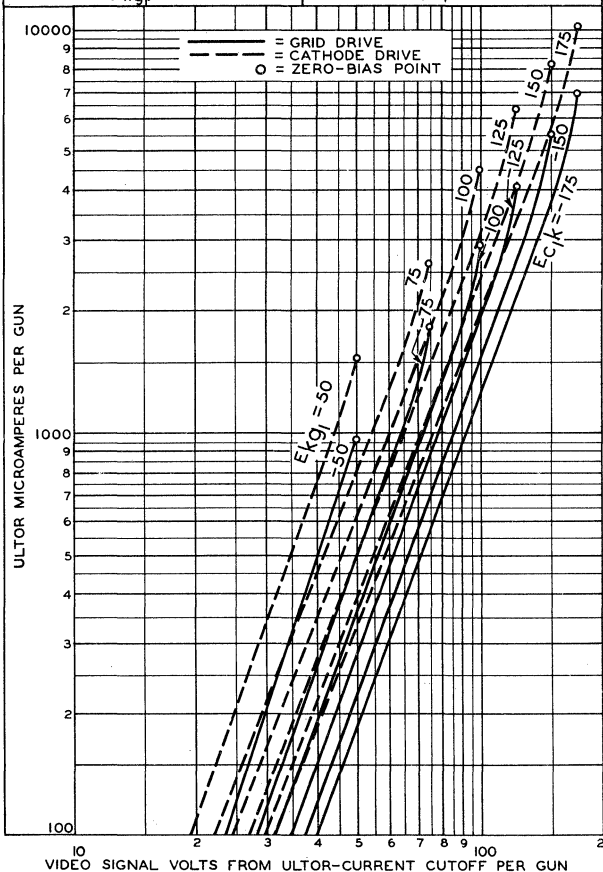
21CYP22



21CYP22

TYPICAL DRIVE CHARACTERISTICS

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



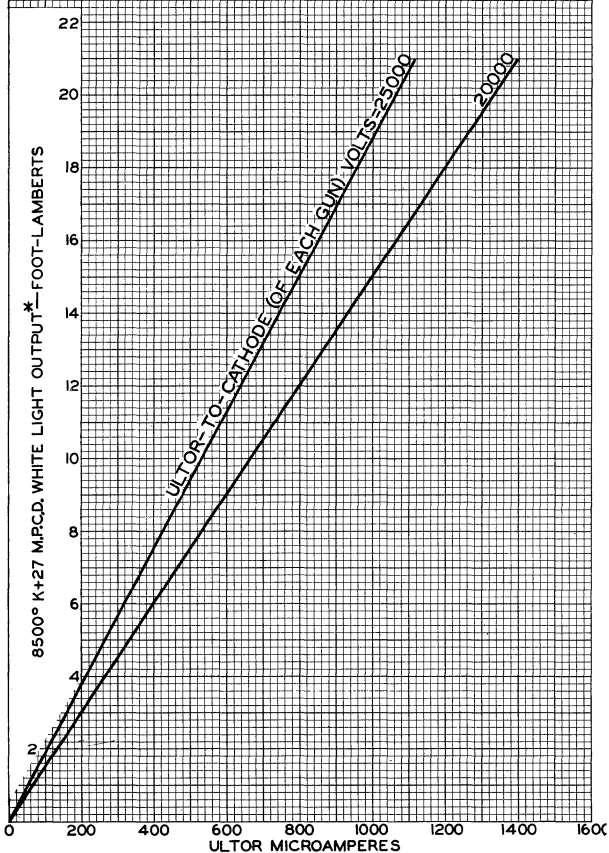


21CYP22

21CYP22

TYPICAL LIGHT-OUTPUT CHARACTERISTICS

$E_p = 6.3$ VOLTS
GRID-N₂3 -TO-CATHODE (OF EACH GUN) VOLTS=ADJUSTED FOR FOCUS
DRIVE OF EACH GUN IS ADJUSTED TO GIVE COMPOSITE ULTOR CURRENT TO PRODUCE 8500° K+27 M.P.C.D. WHITE LIGHT OUTPUT, PERCENTAGE OF TOTAL ULTOR CURRENT SUPPLIED BY EACH GUN TO PRODUCE 8500° K+27 M.P.C.D. WHITE:
RED GUN: 50 %
BLUE GUN: 19 %
GREEN GUN: 31 %
RASTER SIZE: $19\frac{1}{4} \times 14\frac{1}{2}$ " CENTERED ON TUBE FACE.
*MEASURED WITHIN 5" DIAMETER AREA CENTERED ON TUBE FACE.



()

()

()

()

()

()

21CYP22-A

Color Picture Tube

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

ALL-GLASS ENVELOPE
MAGNETIC CONVERGENCE

ELECTROSTATIC FOCUS
MAGNETIC DEFLECTION

Supersedes Type 21CYP22

DATA

General:

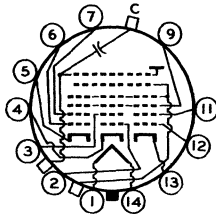
Electron Guns, Three with Axes Tilted Toward Tube Axis	Blue, Green, Red
Heater, for Unipotential Cathode of Each Gun, Paralleled with Each of the Other Two Heaters within Tube: Voltage (AC or DC) [▲]	6.3 volts
Current at 6.3 volts	1.6 amp
Direct Interelectrode Capacitances (Approx.): Grid No.1 of any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



21CYP22-A

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

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



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

Maximum Ratings, Design-Center Values:

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

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

GRID-No.3-TO-CATHODE (Of each gun)
 VOLTAGE 6000 max. volts

GRID-No.2-TO-CATHODE VOLTAGE (Each gun) . . 600 max. volts

GRID-No.1-TO-CATHODE VOLTAGE (Each gun):
 Negative-bias value 400 max. volts
 Positive-bias value 0 max. volts
 Positive-peak value 2 max. volts

PEAK HEATER-CATHODE VOLTAGE (Each gun):
 Heater negative with respect to cathode:
 During equipment warm-up period
 not exceeding 15 seconds 410 max. volts
 After equipment warm-up period 180 max. volts
 Heater positive with respect to cathode. 180 max. volts



21CYP22-A

Equipment Design Ranges:

*With ultor voltage ($E_{c4k\text{each gun}}$)
between 20000♦ and 25000 volts*

Grid-No.3 (Focusing Electrode)-to-Cathode (Of each gun) Voltage.	16.8% to 20% of $E_{c4k\text{each gun}}$	volts	
Grid-No.2-to-Cathode Voltage (Each gun) when circuit design utilizes grid-No.1- to-cathode voltage (E_{c1k}) at fixed value for raster cutoff. . . . .	.See <i>Cutoff Design Chart</i>	
Grid-No.1-to-Cathode Voltage (Each gun) for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2- to-cathode voltage (E_{c2k}) at fixed value. . . . .	.See <i>Cutoff Design Chart</i>	
Variation in Raster Cutoff Between Guns in Any Tube.	$\pm 21\%$ of average of highest and lowest cutoff values		
Grid-No.3 Current.	-45 to +45	μa	
Grid-No.2 Current (Each gun)	-5 to +5	μa	
Percentage of Total Ultor Current Supplied by Each Gun:			
<i>To Produce White of 8500° K + 27 M.P.C.D. (CIE Coordinates $x = 0.287, y = 0.316$):</i>			
Red gun.	49	%	
Blue gun.	18	%	
Green gun.	33	%	
Ratios of Cathode Currents:			
<i>To Produce White of 8500° K + 27 M.P.C.D. (CIE Coordinates $x = 0.287, y = 0.316$):</i>			
	<i>Min.</i>	<i>Typical</i>	<i>Max.</i>
Red cathode to green cathode.	1.2	1.5	1.8
Red cathode to blue cathode	2.1	2.7	3.3
Maximum Raster Shift in Any Direction from Screen Center♦	7/8		inch



21CYP22-A

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

Adjustment to be Provided by
the Following Components:

Lateral-Converging Magnet:‡,⊕

Maximum lateral shift of blue beam ±1/4"

Maximum lateral shift of red beam and
green beam ±1/8" to ±3/8"

Average of maximum lateral shift
of red beam and green beam ±7/32" to ±9/32"

Radial-Converging Magnet Assembly:‡

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

For dynamic convergence#—

Effected by magnetomotive force
of parabolic and/or sawtooth
waveshape synchronized with
scanning.

Horizontal:

Blue pattern—

Parabola amplitude to
provide* Shift of 3/16" to 1/2"

Sawtooth amplitude to
provide# Shift of ±50% of the
shift caused by pa-
rabola amplitude

Red pattern & green pattern—

Parabola:

Amplitude to provide* Shift of 1/16" to 5/16"

Ratio of red-pattern shift
to green-pattern shift 2/3 to 3/2

Sawtooth:

Amplitude to provide# Shift of -60% to +60%
of the shift caused by
parabola amplitude

Difference between red-
pattern shift and green-
pattern shift ($\text{Shift}_R -$
 Shift_G). -75% to +75%

Vertical:

Blue pattern—

Parabola amplitude to
provide* Shift of -1/8" to +1/16"

Sawtooth amplitude to
provide# Shift of -1/16" to +3/16"



21CYP22-A

Red pattern & green pattern—

Parabola:

Amplitude to provide* Shift of 1/8" to 5/16"

Ratio of red-pattern shift
to green-pattern shift 2/3 to 3/2

Sawtooth:

Amplitude to provide* . . . Shift of -1/8" to +3/16"

Difference between red-
pattern shift and green-
pattern shift (Shift_R -
Shift_G). -100% to +100%

Examples of Use of Design Ranges:

For ultor voltage of	20000	25000	volts
Grid-No.3 (Focusing Electrode)-to-Cathode (Of each gun) Voltage. . .	3360 to 4000	4200 to 5000	volts
Grid-No.2-to-Cathode Voltage (Each gun) when circuit design utilizes grid-No.1-to-cathode voltage of -70 volts for raster cutoff.	130 to 370	130 to 370	volts
Grid-No.1-to-Cathode Voltage (Each gun) for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2-to-cathode voltage of 200 volts . . .	-45 to -100	-45 to -100	volts

Limiting Circuit Values:

High-Voltage Circuits:

In order to minimize the possibility of damage to the tube caused by a momentary internal arc, it is recommended that the *high-voltage power supply* and the *grid-No.3 power supply* be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 50 milliamperes. In addition, to prevent cathode damage with resultant decrease in tube life, an external resistor having a value of 50,000 ohms must be connected between the two bulb terminals and the effective resistance between the grid-No.3 power-supply output capacitor and the grid-No.3 electrode should not be less than 50,000 ohms. These resistances should be capable of withstanding the maximum instantaneous currents and voltages in their respective circuits. It is to be noted that the high voltage must be connected only to the High-Voltage-Supply Terminal—*never directly to the Ultor Terminal*. A resistor of 50,000 ohms must be connected between the Ultor Terminal and the High-Voltage-Supply Terminal.

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



21CYP22-A

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

Low-Voltage Circuits:

Effective Grid-No.1-to-Cathode-

Circuit Resistance (Each gun). 0.75 max. megohm

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

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

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

● For Curves, see front of this Section.

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

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

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

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

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

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

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

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

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



DEFINITIONS

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

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

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

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

GENERAL CONSIDERATIONS

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

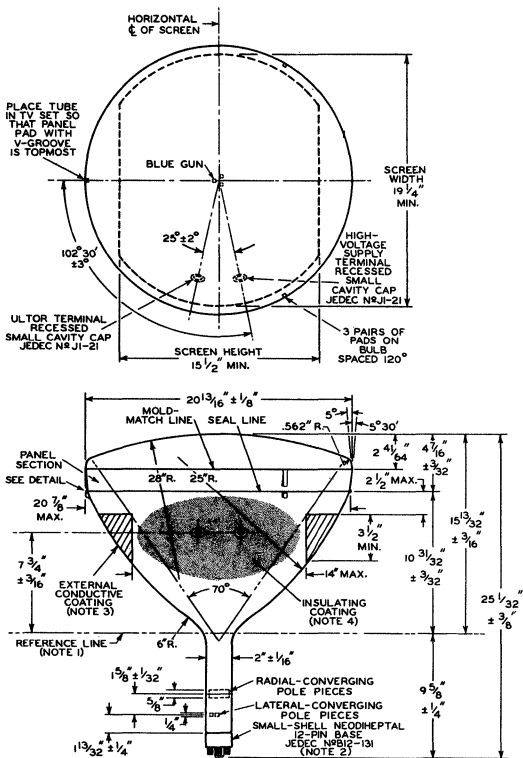
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of this color picture tube to protect it from being struck accidentally and to protect against possible damage resulting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

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

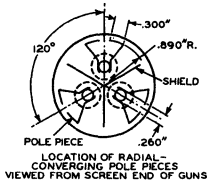
**REFERENCE-LINE AND NECK-FUNNEL-CONTOUR GAUGE
for Type 21CYP22-A is the same as that shown for
Type 21AXP22-A**



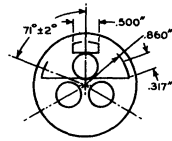
21CYP22-A



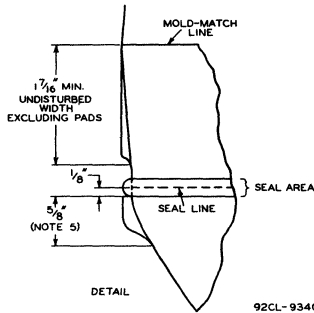
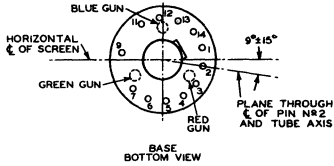
21CYP22-A



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



LOCATION OF LATERAL-
 CONVERGING POLE PIECES
 WITH RESPECT TO GUNS



21CYP22-A

NOTE 1: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE AND NECK-FUNNEL-CONTOUR GAUGE AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

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

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

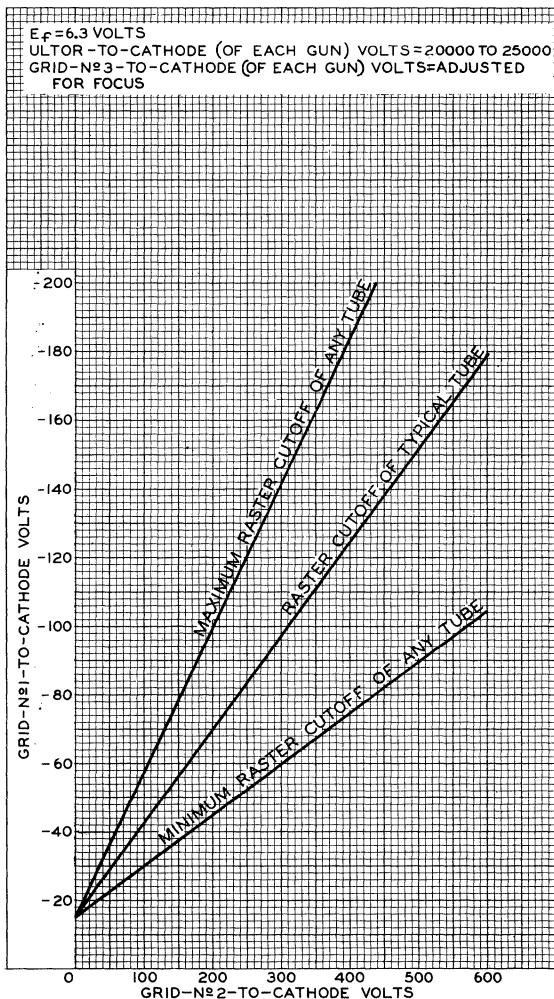
NOTE 4: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

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



21CYP22-A

CUTOFF DESIGN CHART



92CM-8565R1



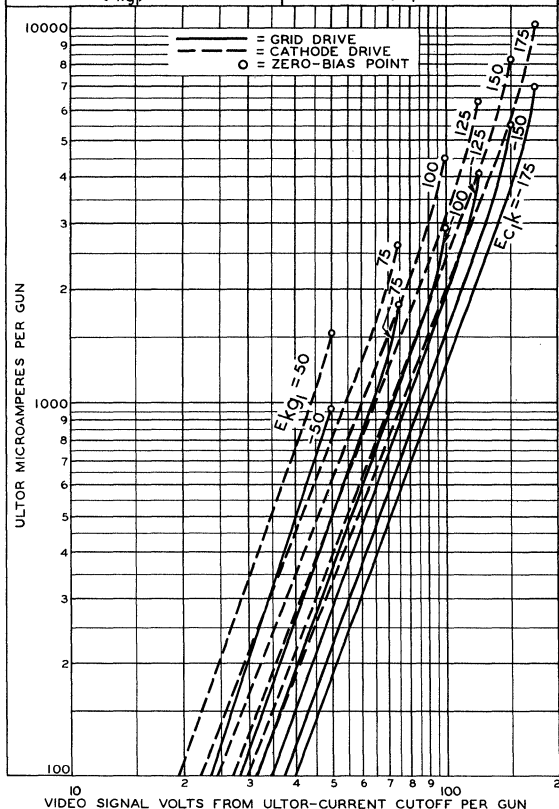
RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 6
10-60

21CYP22-A

TYPICAL DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
$E_f = 6.3$ VOLTS	$E_f = 6.3$ VOLTS
ULTOR-TO-GRID-N ^o 1 (OF EACH GUN) VOLTS = 20000 TO 25000	ULTOR-TO-CATHODE (OF EACH GUN) VOLTS = 20000 TO 25000
GRID-N ^o 3-TO-GRID-N ^o 1 (OF EACH GUN) VOLTS=ADJUSTED FOR FOCUS	GRID-N ^o 3-TO-CATHODE (OF EACH GUN) VOLTS=ADJUSTED FOR FOCUS
GRID-N ^o 2-TO-GRID-N ^o 1 VOLTS (EACH GUN)=ADJUSTED TO PROVIDE ULTOR-CURRENT CUT-OFF FOR DESIRED FIXED CATHODE-TO-GRID-N ^o 1 (EACH GUN) VOLTAGE (E_{cjk})	GRID-N ^o 2-TO-CATHODE VOLTS (EACH GUN)=ADJUSTED TO PROVIDE ULTOR-CURRENT CUT-OFF FOR DESIRED FIXED GRID-N ^o 1-TO-CATHODE (EACH GUN) VOLTAGE (E_{cjk})

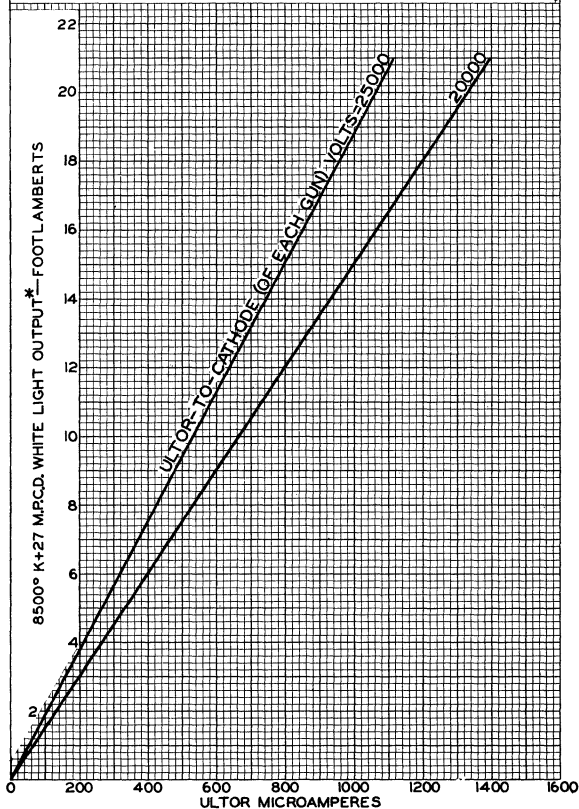


92CL-9421



TYPICAL LIGHT-OUTPUT CHARACTERISTICS

$E_f = 6.3$ VOLTS
 GRID-№3 - TO-CATHODE (OF EACH GUN) VOLTS = ADJUSTED FOR FOCUS
 DRIVE OF EACH GUN IS ADJUSTED TO GIVE COMPOSITE ULTOR CURRENT TO PRODUCE 8500° K+27 M.P.C.D. WHITE LIGHT OUTPUT, PERCENTAGE OF TOTAL ULTOR CURRENT SUPPLIED BY EACH GUN TO PRODUCE 8500° K+27 M.P.C.D. WHITE:
 RED GUN: 50 %
 BLUE GUN: 19 %
 GREEN GUN: 31 %
 RASTER SIZE: $19\frac{1}{4} \times 14\frac{1}{2}$ " CENTERED ON TUBE FACE.
 * MEASURED WITHIN 5" DIAMETER AREA CENTERED ON TUBE FACE.



92CM-9417





21DEP4-A

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	$\mu\mu\text{f}$
Cathode to all other electrodes	5	$\mu\mu\text{f}$
External conductive coating to ultor.	{2500 max. 2000 min.	{ $\mu\mu\text{f}$ $\mu\mu\text{f}$
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" \pm 5/16"	
Greatest width	20-1/4" \pm 1/8"	
Greatest height	16-3/8" \pm 1/8"	
Diagonal	21-3/8" \pm 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)	

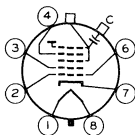
2IDEP4-A



2IDEP4-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_{c5k}) between 15000[±] and 20000 volts
and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts*

Grid-No.4 Voltage for focus [§]	0 to 500	volts
Grid-No.1 Voltage (E_{c1k}) for visual extinc- tion of focused raster	<i>See Raster-Cutoff-Range Chart for Grid-Drive Service</i>	
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	μ a
Grid-No.2 Current.	-15 to +15	μ a
Field Strength of Adjust- able Centering Magnet*	0 to 8	gausses



21DEP4-A

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_{c5g1}) between 15000[■] 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§	0 to 500	volts
Cathode-to-Grid-No.1		
Voltage (E_{kg1}) for visual extinction of focused raster. . . . .	.See Raster-Cutoff-Range Chart for Cathode-Drive Service	

21DEP4-A



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	
	E_{k_1} except video drive is a	
	negative voltage	
Grid-No.4 Current.	-25 to +25	μ a
Grid-No.2 Current.	-15 to +15	μ a
Field Strength of Adjust-		
able Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

<i>With ultor-to-grid-</i>		
<i>No.1 voltage of</i>	<i>16000</i>	<i>volts</i>
<i>and grid-No.2-to-grid-</i>		
<i>No.1 voltage of</i>	<i>400</i>	<i>volts</i>
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.

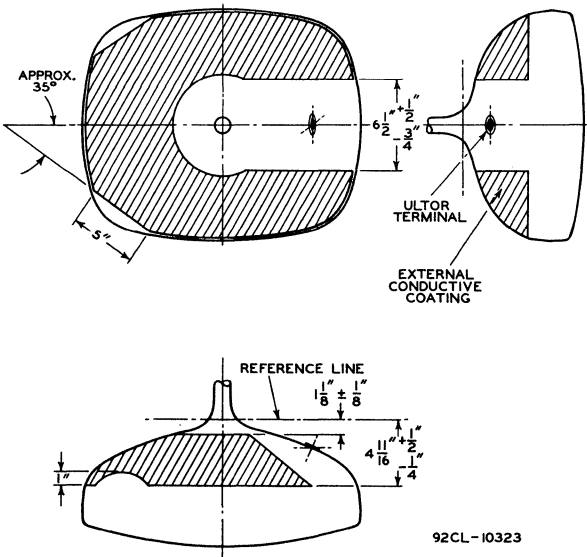
*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*



2IDEP4-A PICTURE TUBE

2IDEP4-A

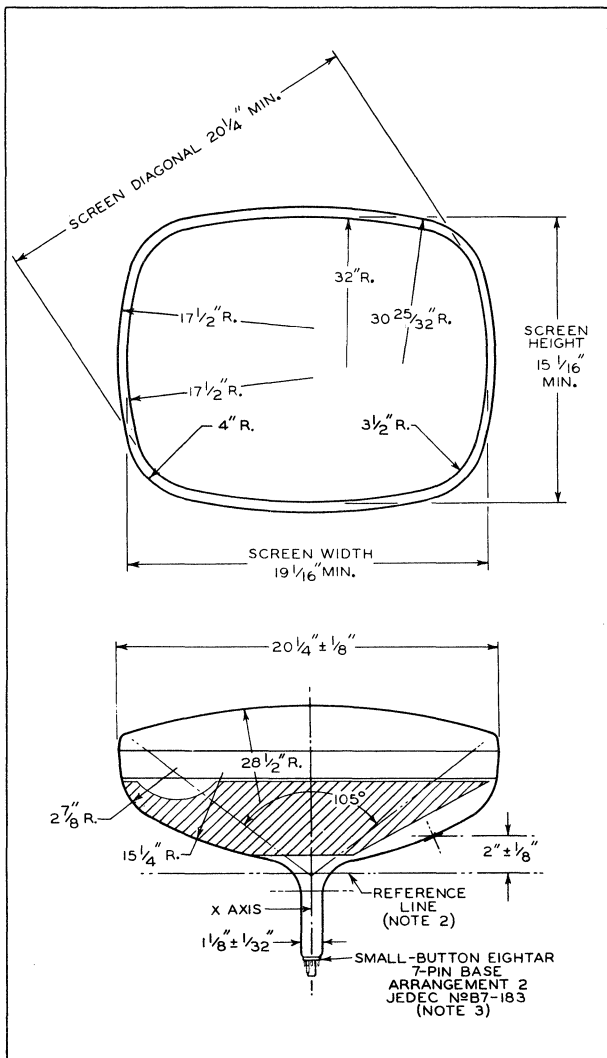
DETAIL SHOWING EXTERNAL CONDUCTIVE COATING



2IDEP4-A



2IDEP4-A PICTURE TUBE

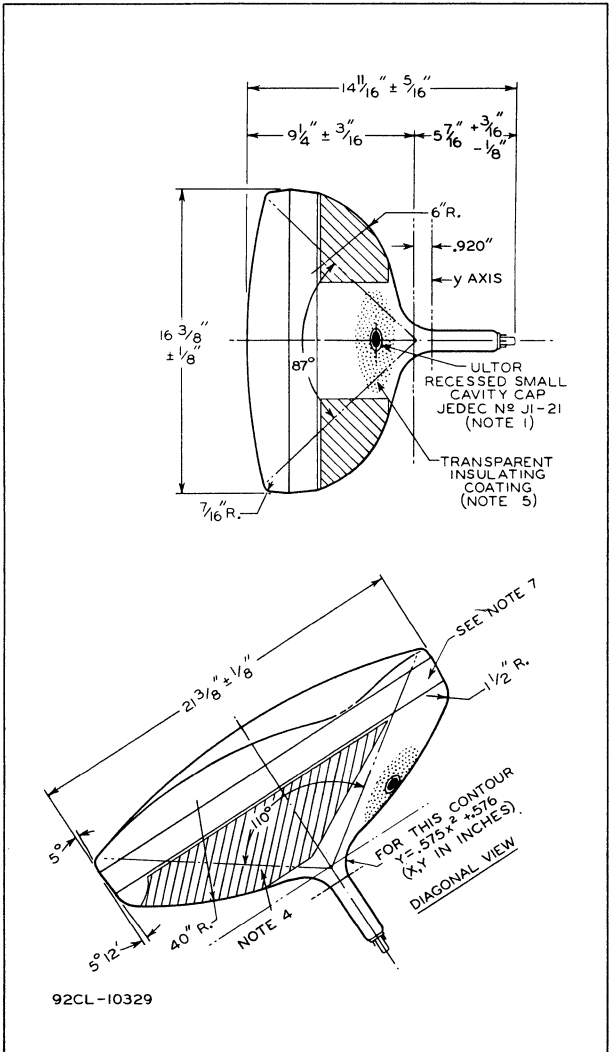




2IDEP4-A

PICTURE TUBE

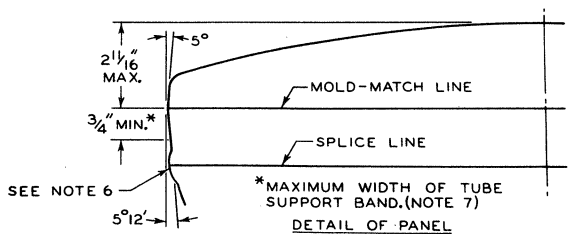
2IDEP4-A



2IDEP4-A



2IDEP4-A PICTURE TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. 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 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.

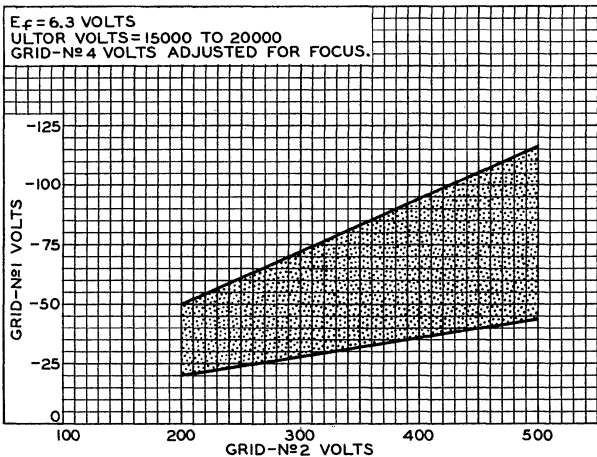
NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.



2IDEP4-A

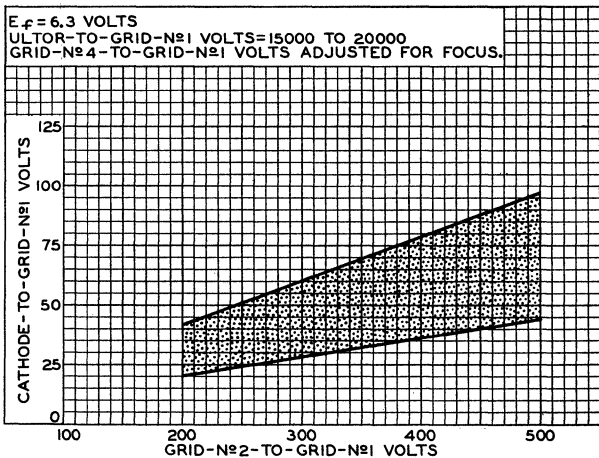
2IDEP4-A

RASTER-CUTOFF-RANGE CHARTS
GRID-DRIVE SERVICE



92CS-10324

CATHODE-DRIVE SERVICE



92CS-10325

21DEP4-A



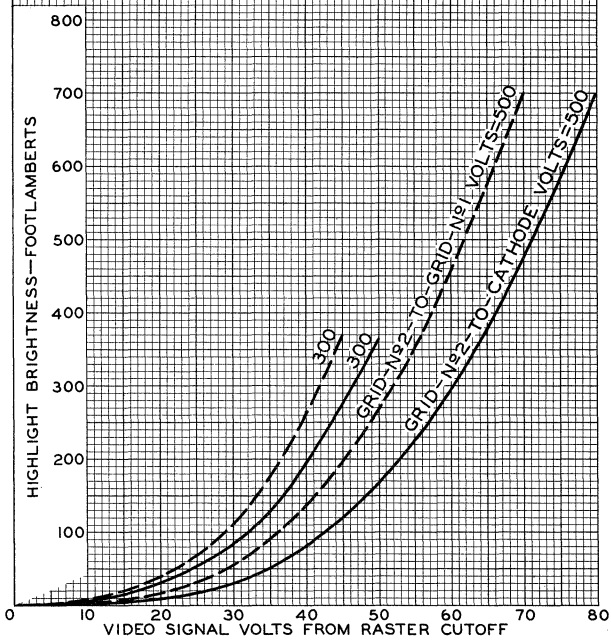
21DEP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
$E_f = 6.3$ VOLTS	$E_f = 6.3$ VOLTS
ULTOR-TO-GRID- N_{g1} VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID N_{g1} TO GIVE FOCUSED RASTER CUTOFF.	GRID N_{g1} 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 13 1/2"	RASTER SIZE = 18" x 13 1/2"

I.C.I. COORDINATES OF SCREEN: $x = 0.270$, $y = 0.300$

- - - CATHODE DRIVE
 ——— GRID DRIVE



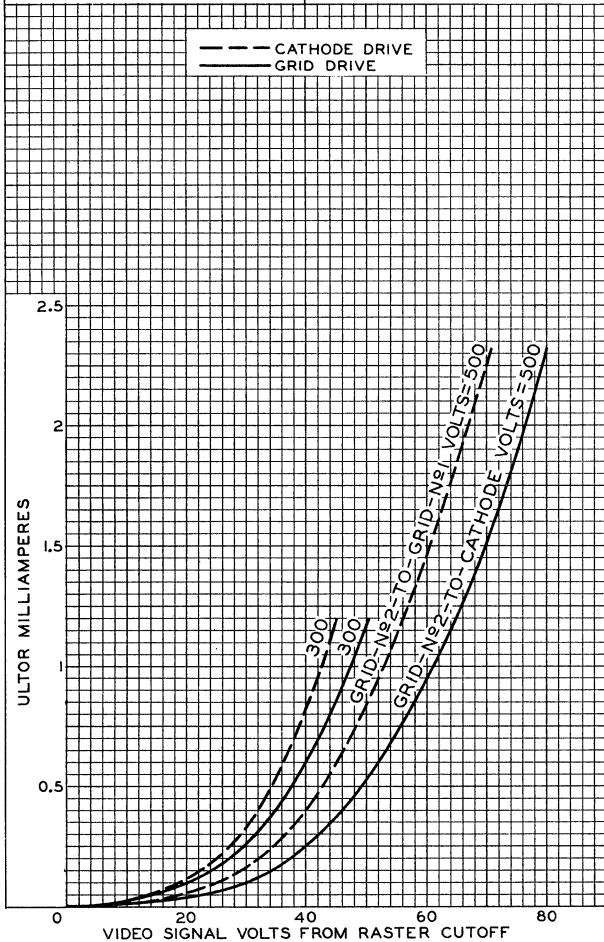


2IDEP4-A

2IDEP4-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 = 15000 TO 20000	ULTOR VOLTS = 15000 TO 20000
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.





2IDFP4 PICTURE TUBE

2IDFP4

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN
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 $\mu\mu\text{f}$
 Cathode to all other electrodes 5 $\mu\mu\text{f}$
 External conductive coating to ultor. $\left\{ \begin{array}{l} 2200 \text{ max.} \\ 1500 \text{ min.} \end{array} \right. \mu\mu\text{f}$

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" \pm 5/16"
 Greatest width 20-1/4" \pm 1/8"
 Greatest height 16-3/8" \pm 1/8"
 Diagonal 21-3/8" \pm 1/8"
 Neck length 5-7/16" \pm 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)

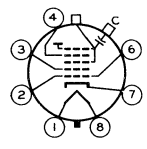
Bulb J171 (110°)

Socket Ucinite Part No.115446, or equivalent

Base Small-Button Eightar 7-Pin,
 Arrangement 2, (JETEC No.87-183)

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



2IDFP4

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_{C5k}) between 12000 and 18000 volts and grid-No.2 voltage (E_{C2k}) between 200 and 500 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	μ a
Grid-No.2 Current.	-15 to +15	μ a
Field Strength of Adjustable Centering Magnet*.	0 to 8	gausses

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.



2IDFP4

2IDFP4

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_{c5g1}) between 12000 and 18000 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[§] 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 μ a

▲, ⊕, §, *, ■: See next page.

2IDFP4



2IDFP4

PICTURE TUBE

Grid-No.2 Current.	-15 to +15	μ a
Field Strength of Adjustable Centering Magnet*.	0 to 8	gausses

Examples of Use of Design Ranges:

<i>With ultor-to-grid-</i>			
<i>No.1 voltage of</i>	14000	16000	volts
<i>and grid-No.2-to-grid-</i>			
<i>No.1 voltage of</i>	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 2IDFP4 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 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 2ICEP4
also apply to the 2IDFP4**

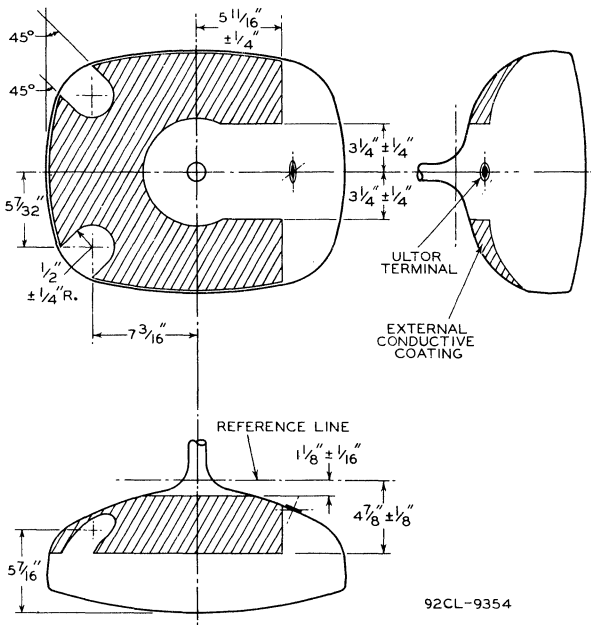


2IDFP4

PICTURE TUBE

2IDFP4

DETAIL SHOWING EXTERNAL CONDUCTIVE COATING

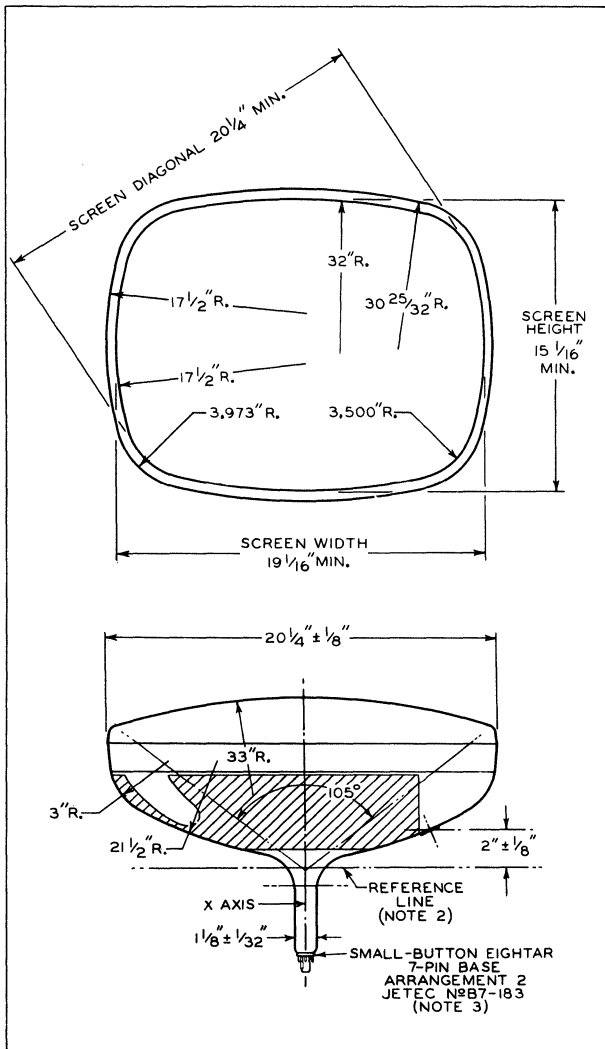


92CL-9354

2IDFP4



2IDFP4 PICTURE TUBE

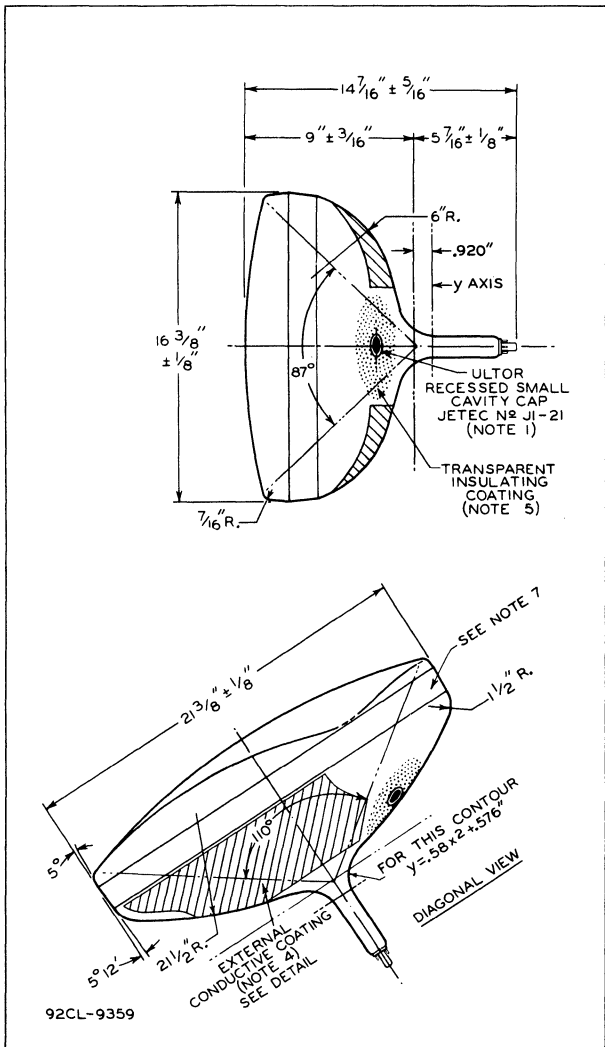




2IDFP4

PICTURE TUBE

2IDFP4

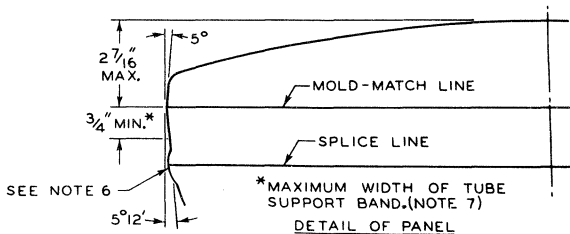


2IDFP4



2IDFP4

PICTURE TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. 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 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.

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.

21DHP4

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	μf
Cathode to all other electrodes. . . .	5	μf
External conductive coating to ultor .	{ 2500 max.	μf
	{ 1700 min.	μf
Electron Gun	Type Requiring No Ion-Trap Magnet	

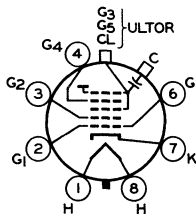
Optical:

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 <i>Picture-Tube Dimensional-Outlines</i> and <i>Bulb J171 G/K</i> sheets at the front of this section	
Cap.	Recessed Small Cavity (JEDEC No.J1-21)
Bases (Alternates):	
Small-Button Eightar 7-Pin, Arrangement 2, (JEDEC No.B7-183)	
Small-Button Neoeightar 7-Pin, Arrangement 1, (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

21DLP4 PICTURE TUBE

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
 Voltage 6.3 ac or dc volts
 Current $0.6 \pm 10\%$ amp

Direct Interelectrode Capacitances:
 Grid No.1 to all other electrodes 6 $\mu\mu\text{f}$
 Cathode to all other electrodes 5 $\mu\mu\text{f}$
 External conductive coating to ultor. $\left\{ \begin{array}{l} 2500 \text{ max.} \\ 2000 \text{ min.} \end{array} \right. \mu\mu\text{f}$

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 $17'' \pm 3/8''$
 Greatest width $20-1/4'' \pm 1/8''$
 Greatest height $16-3/8'' \pm 1/8''$
 Diagonal $21-3/8'' \pm 1/8''$
 Neck length $4-1/2'' \pm 3/16''$

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

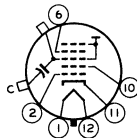
Cap Recessed Small Cavity (JETEC No. J1-21)

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



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. 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.	? 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_{C5k}) between 12000 and 20000 volts
and grid-No.2 voltage (E_{C2k}) between 200 and 500 volts*

Grid-No.4 Voltage for focus [§]	-50 to +400	volts
Grid-No.1 Voltage (E_{C1k}) for visual extinction of focused raster.	<i>See Raster-Cutoff-Range Chart for Grid-Drive Service</i>	
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	μ a
Grid-No.2 Current.	-15 to +15	μ a
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.



2IDL P4

PICTURE TUBE

2IDL P4

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. 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 [§]	0 to 450	volts
Cathode-to-Grid-No.1 Voltage (E_{kg1}) for visual extinction of focused raster.	<i>See Raster-Cutoff-Range Chart for Cathode-Drive Service</i>	

▲, ⊕, §, *, ■: 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_{k1} except video drive is a	
	negative voltage	
Grid-No.4 Current	-25 to +25	μ a
Grid-No.2 Current	-15 to +15	μ a
Field Strength of Adjust-		
able Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

<i>With ultor-to-grid-</i>		
<i>No.1 voltage of</i>	<i>16000</i>	<i>volts</i>
<i>and grid-No.2-to-grid-</i>		
<i>No.1 voltage of</i>	<i>300</i>	<i>volts</i>
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.

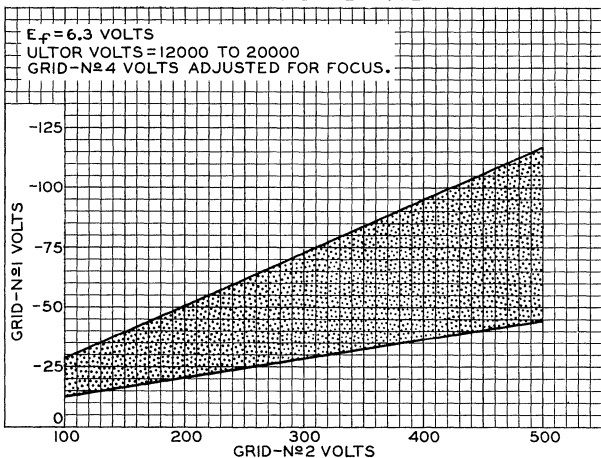
*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*



21DLP4

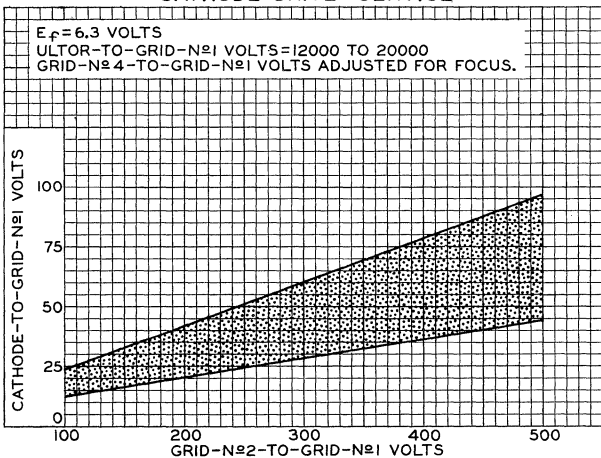
21DLP4

RASTER-CUTOFF-RANGE CHARTS GRID-DRIVE SERVICE



92CS-9349V

CATHODE-DRIVE SERVICE

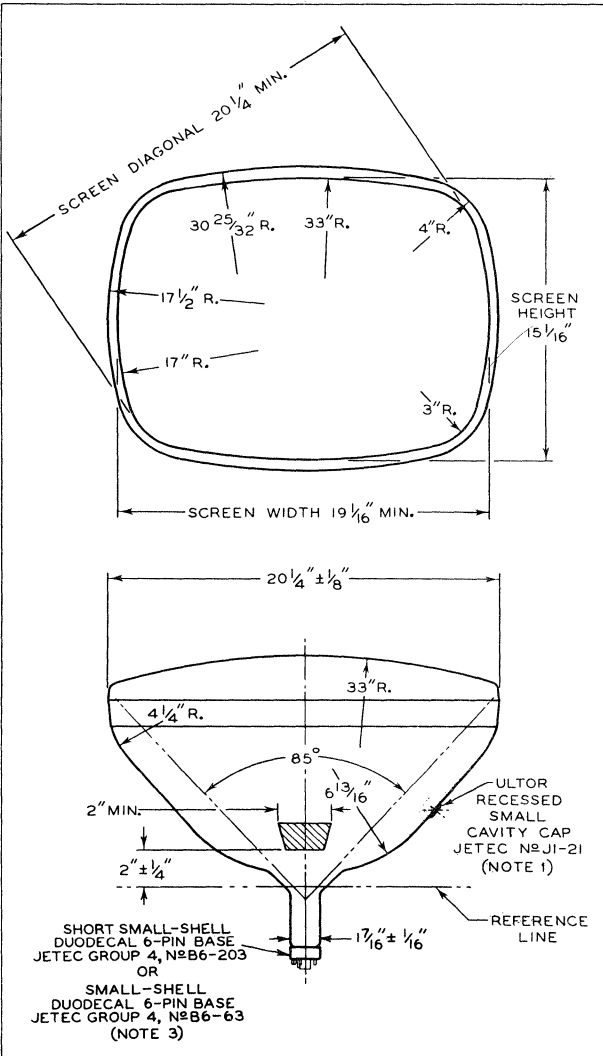


92CS-9350V

21DLP4



21DLP4
PICTURE TUBE

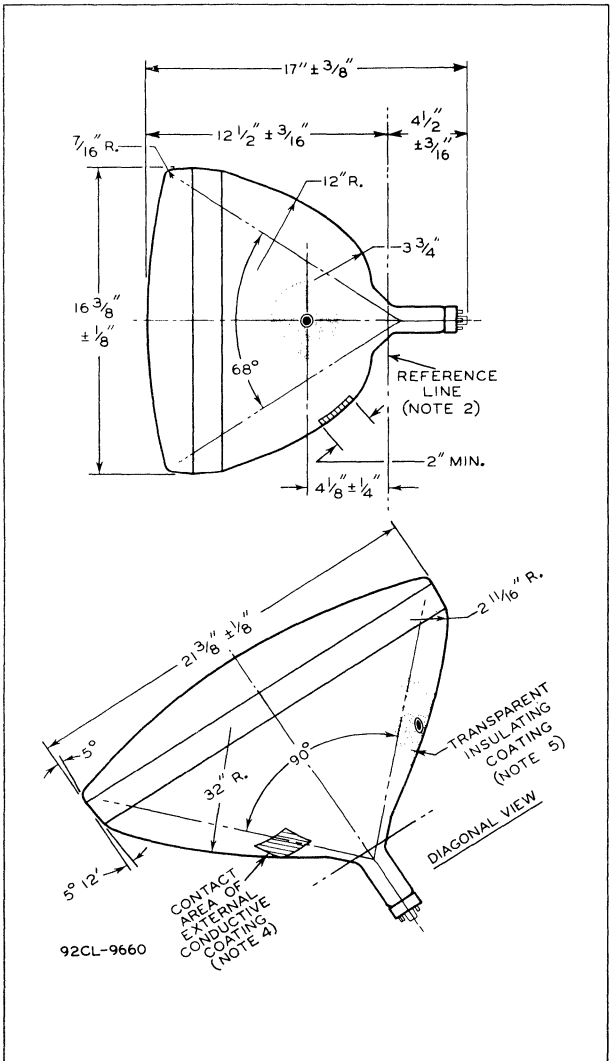




21DLP4

PICTURE TUBE

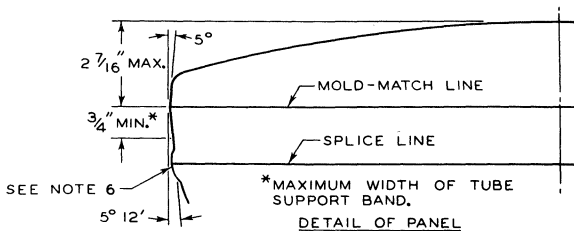
21DLP4





21DLP4

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 $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No. G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT 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.

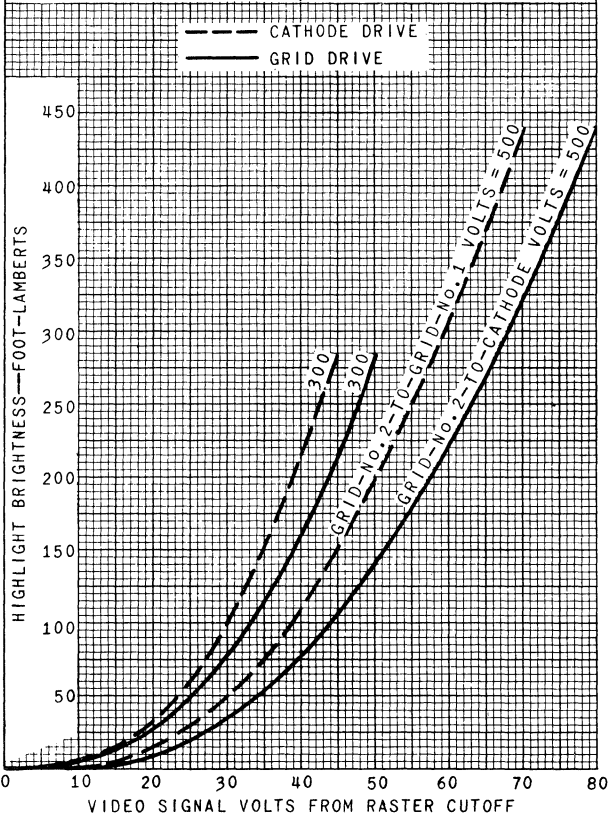


21DLP4

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"



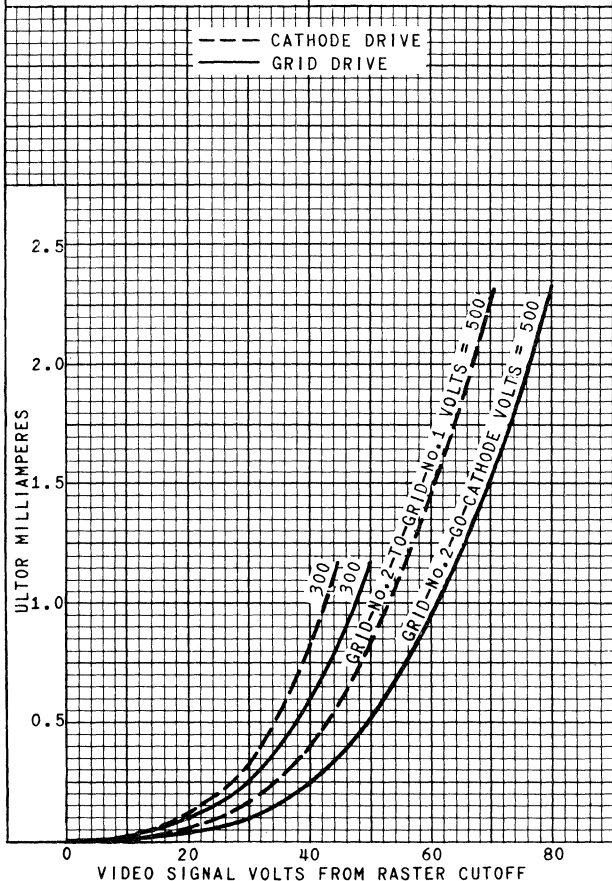
21DLP4



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.





21D5P4

PICTURE TUBE

21D5P4

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS
LOW GRID-NO.2 VOLTAGE

ALUMINIZED SCREEN
MAGNETIC DEFLECTION
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 μ f
Cathode to all other electrodes 5 μ f
External conductive coating to ultor. {2500 max. μ f
{2000 min. μ f

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" \pm 3/8"

Greatest width. 20-1/4" \pm 1/8"

Greatest height 16-3/8" \pm 1/8"

Diagonal. 21-3/8" \pm 1/8"

Neck length 5-1/2" \pm 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)

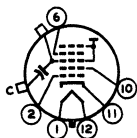
21DSPA



21DSPA 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.1 Voltage for focus δ	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg1}) for visual extinction of focused raster.	<i>See Raster-Cutoff-Range Chart</i>	
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	



21D5P4

PICTURE TUBE

21D5P4

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

Examples of Use of Design Ranges:

<i>With ultor-to-grid-</i>		
<i>No.1 voltage of</i>	18000	volts
<i>and grid-No.2-to-grid-</i>		
<i>No.1 voltage of</i>	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.

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_{k_1}) 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.

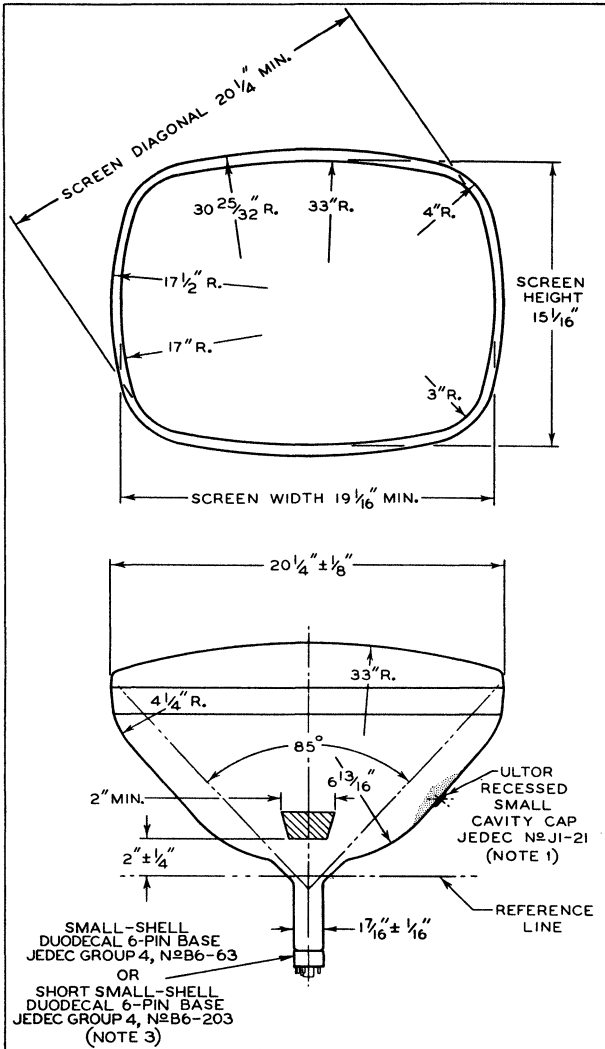
*For x-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*

2IDSP4



2IDSP4

PICTURE TUBE

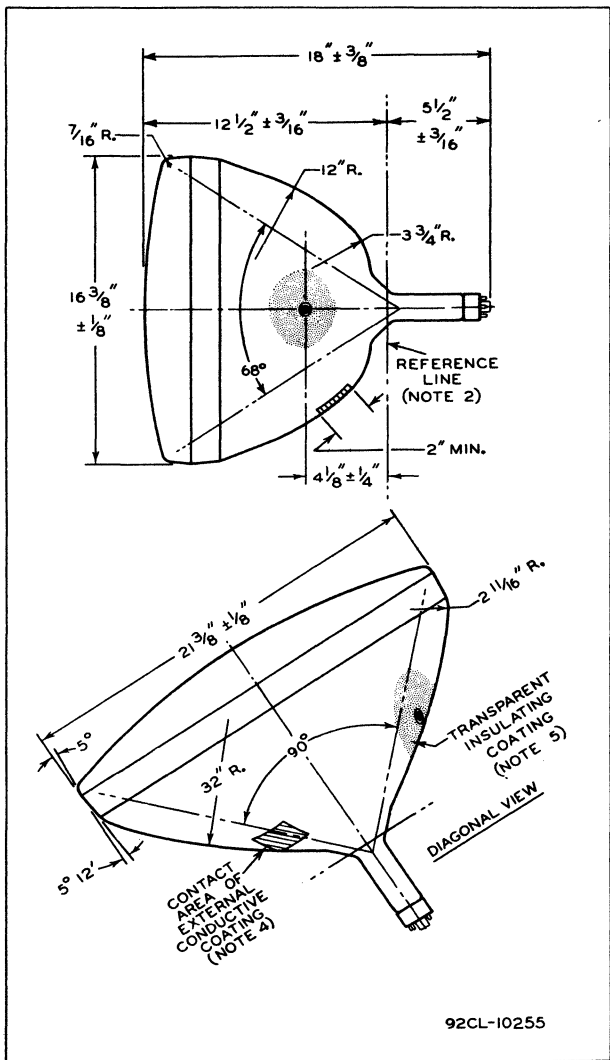




2IDSP4

PICTURE TUBE

2IDSP4

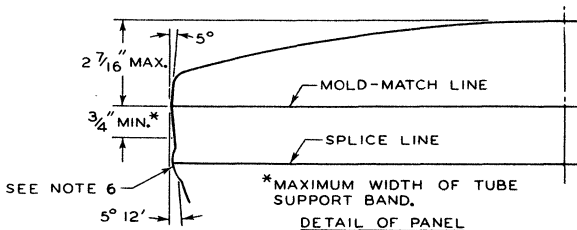


2IDSP4



2IDSP4

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 $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No. G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE 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.

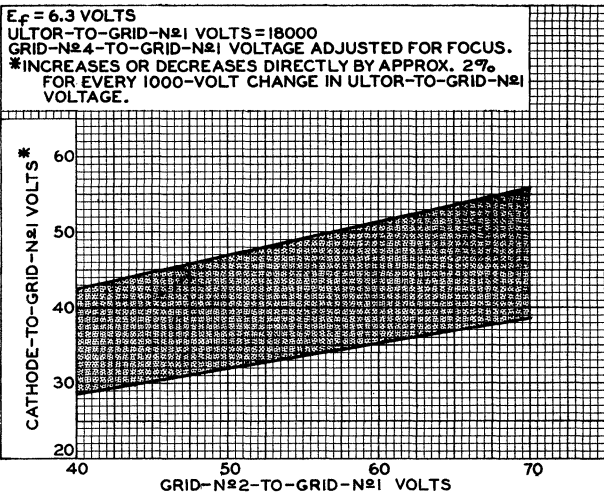
NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.



21DSP4

21DSP4

RASTER-CUTOFF-RANGE CHART



92CS-9911

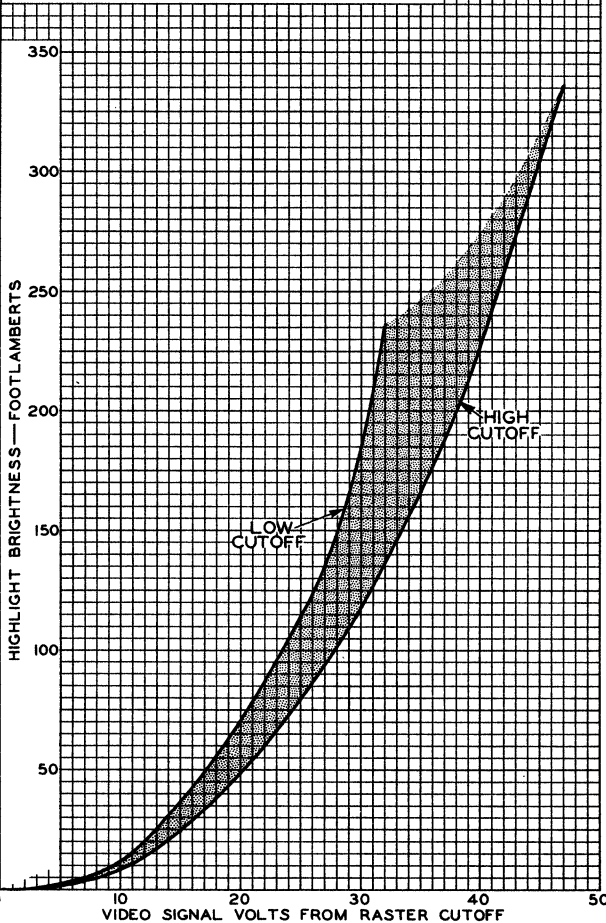
2IDSP4



2IDSP4

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"



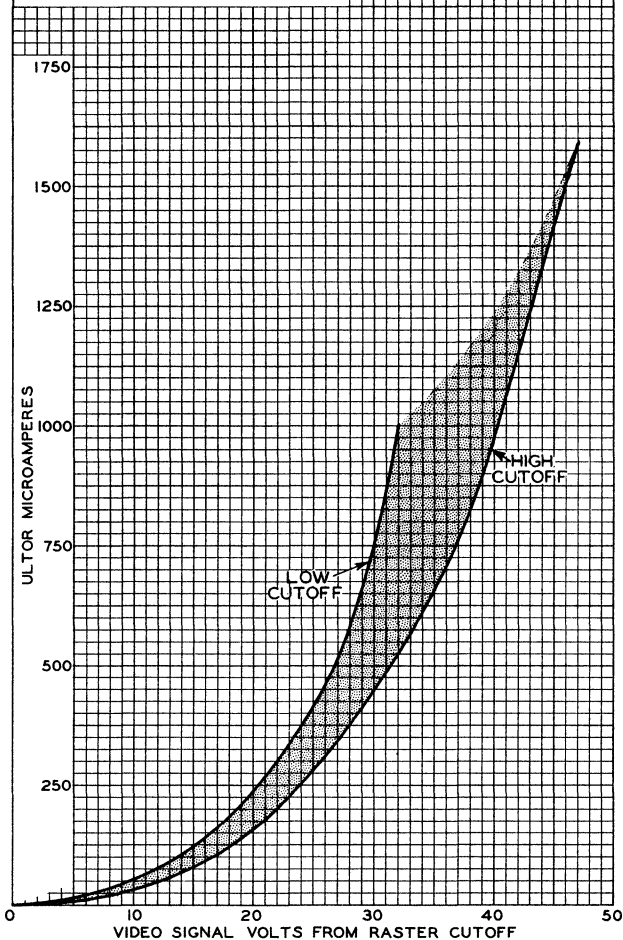


2IDSP4

2IDSPA

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.



21EP4B

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.	{ 750 max. 500 min.	{ pf pf
Heater Current at 6.3 volts	600 ± 60	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, 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

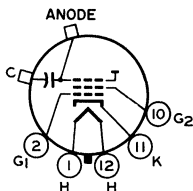
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J170 A/C* sheets
at front of this section

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



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

← Indicates a change.



21EP4B

→ Maximum and Minimum Ratings, Design-Maximum Values:

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

ANODE VOLTAGE	19800 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:		
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

→ Indicates a change.





21EQP4 PICTURE TUBE

21EQP4

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 $\mu\mu\text{f}$
Cathode to all other electrodes 5 $\mu\mu\text{f}$
External conductive coating to ultor $\left\{ \begin{array}{l} 2500 \text{ max. } \mu\mu\text{f} \\ 2000 \text{ min. } \mu\mu\text{f} \end{array} \right.$

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 $12-9/16" \pm 5/16"$
Greatest width $20-1/4" \pm 1/8"$
Greatest height $16-3/8" \pm 1/8"$
Diagonal $21-3/8" \pm 1/8"$
Neck length $3-9/16" \pm 1/8"$

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)

21EQP4

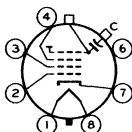


21EQP4

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[▲] 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_{c4k}) between 12000 and 18000 volts
 and grid-No.2 voltage (E_{c2k}) between 400 and 550 volts*

Grid-No.3 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.3 Current	-25 to +25 μ a



21EQP4

PICTURE TUBE

21EQP4

Grid-No.2 Current	-15 to +15	μ a
Field Strength of Adjustable Centering Magnet	0 to 10	gausses

Examples of Use of Design Ranges:

<i>With ultor voltage of</i>	16000	18000	volts
<i>and grid-No.2 voltage of</i>	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_{c1g1}) between 12000 and 18000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 400 and 690 volts

Grid-No.3-to-Grid-No.1 Voltage for focus [§]	0 to 400	volts
---	----------	-------

21EQP4



21EQP4

PICTURE TUBE

Cathode-to-Grid-No.1 Voltage (E_{k_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_{k_1} except video drive is a negative voltage

Grid-No.3 Current -25 to +25 μ a
Grid-No.2 Current -15 to +15 μ a
Field Strength of Adjustable Centering Magnet¹. 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

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

² 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.

³ 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

21EQP4

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

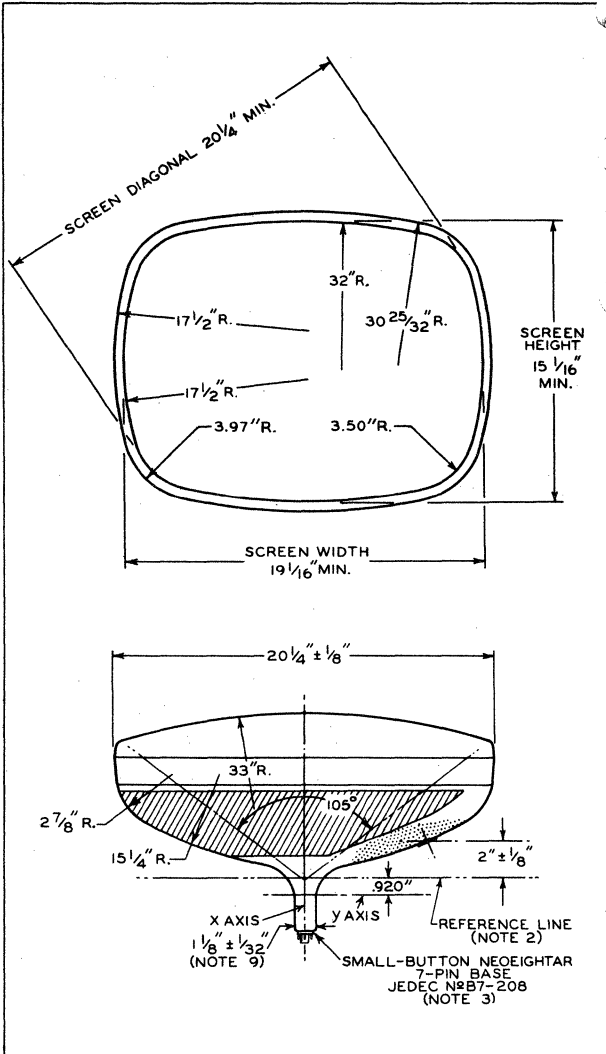
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 21EQP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion 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*

21EQP4



21EQP4 PICTURE TUBE

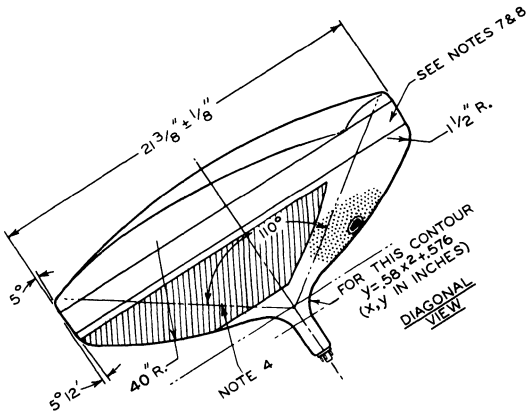
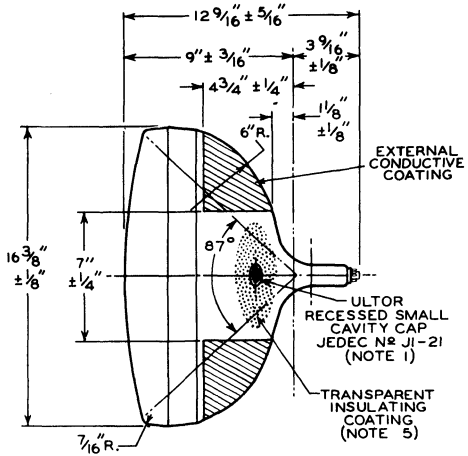




21EQP4

PICTURE TUBE

21EQP4



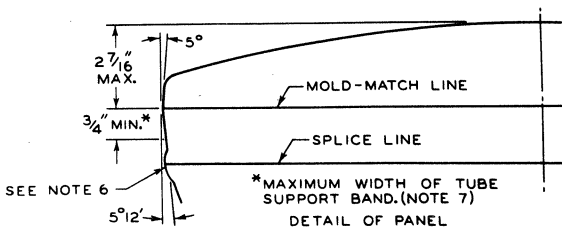
92CL-9936R1

21EQP4



21EQP4

PICTURE TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. 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.

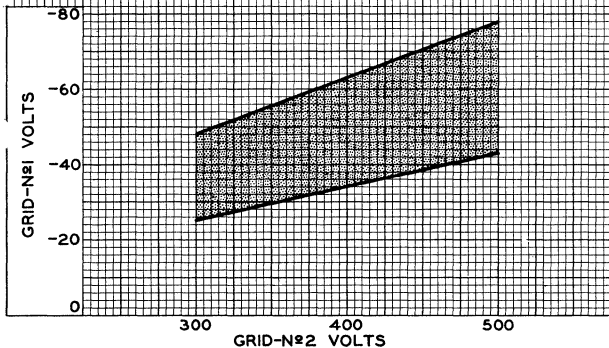


21EQP4

21EQP4

RASTER-CUTOFF-RANGE CHARTS GRID-DRIVE SERVICE

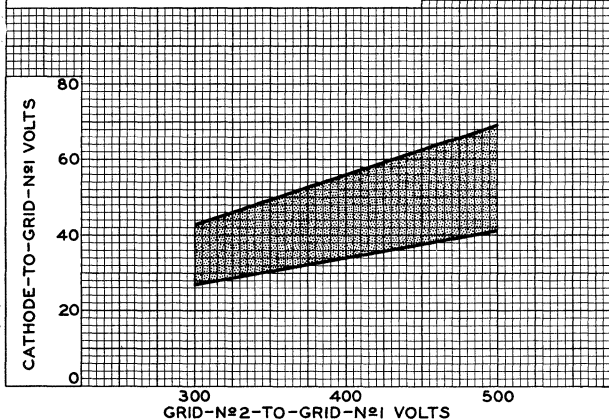
$E_f = 6.3$ VOLTS
ULTOR VOLTS = 12000 TO 18000
GRID-N $\#$ 3 VOLTS ADJUSTED FOR FOCUS.



92CS-9933

CATHODE-DRIVE SERVICE

$E_f = 6.3$ VOLTS
ULTOR-TO-GRID-N#1 VOLTS = 12000 TO 18000
GRID-N#3-TO-GRID-N#1 VOLTS ADJUSTED
FOR FOCUS.



92CS-9934

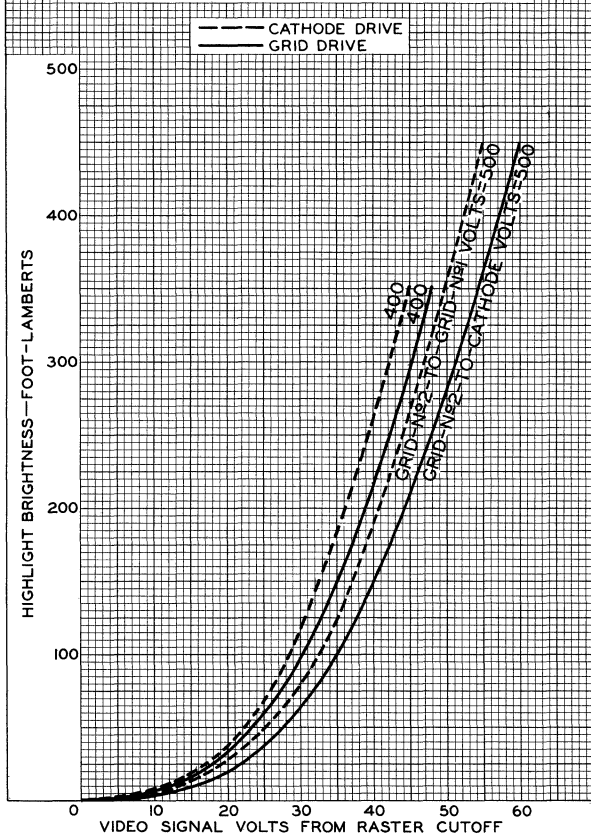
21EQP4



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 13 1/2"	RASTER SIZE = 18" x 13 1/2"

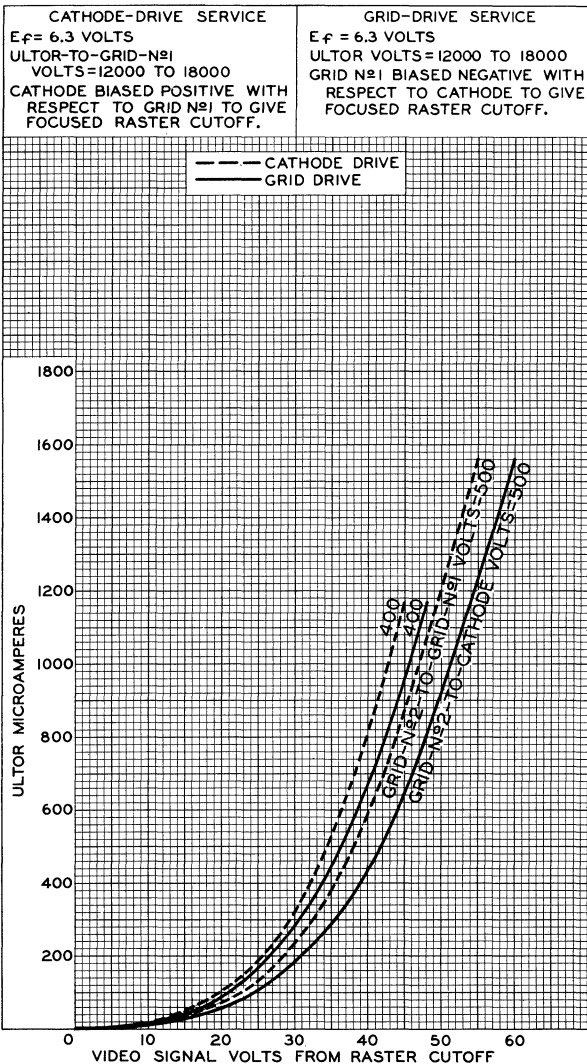
I.C.I. COORDINATES OF SCREEN: $x=0.270$, $y=0.300$ 



21EQP4

21EQP4

AVERAGE DRIVE CHARACTERISTICS



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9935

①

②

③

④

⑤

⑥

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.	volts
	{ 2.4 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	450 max.	volts
After equipment warm-up period.	200 max.	volts
Heater positive with respect to cathode:		
Combined AC and DC voltage.	200 max.	volts
DC component.	100 max.	volts

Typical Operating Conditions for Grid-Drive Service:

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

Anode Voltage	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



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

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



21FP4C

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC 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.	{ 750 max.	pf
	{ 500 min.	pf
Heater Current at 6.3 volts	600 ± 60	ma
Electron Gun.	Ion-Trap Type Requiring External Single-Field Magnet	

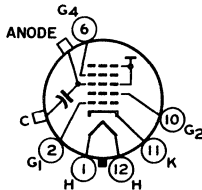
Optical:

Phosphor (For curves, see front of this section). P4—Sulfide Type, Aluminized
 Faceplate, 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	19800 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value.	1100 max.	volts
Negative value.	550 max.	volts



21FP4C

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.	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





21MP4

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 $0.6 \pm 10\%$ 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 $19-23/32" \pm 1/8"$
 Greatest height at lip $15-5/16" \pm 1/8"$
 Diagonal at lip $20-3/4" \pm 1/4"$
 Neck length $7-1/2" \pm 3/16"$
 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"

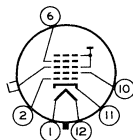
Operating Position Any

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.

2IMP4



2IMP4

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*

21WP4A

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.	$\left\{ \begin{array}{l} 750 \text{ max.} \\ 500 \text{ min.} \end{array} \right.$	pf
		ma

Heater Current at 6.3 volts 600 ± 60 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.). 73% ←

Mechanical:

Weight (Approx.). 24 lbs
 Overall Length. 22-7/16" ± 3/8"
 Neck Length 7-1/2" ± 3/16"
 Projected Area of Screen. 224 sq. in.

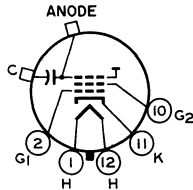
External Conductive Coating:
 Type. Regular-Band
 Contact area for grounding. Near Reference Line
 For Additional Information on Coatings and Dimensions:

See *Picture-Tube Dimensional-Outlines and Bulb J165 Z* 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 19800 max. volts

← Indicates a change.



21WP4A

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.	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





21XP4-A

PICTURE TUBE

21XP4-A

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 $0.6 \pm 10\%$ amp

Capacitance between External Conductive

Coating and Ultor $\left\{ \begin{array}{l} 2500 \text{ max. } \mu\mu\text{f} \\ 2000 \text{ min. } \mu\mu\text{f} \end{array} \right.$

Faceplate, Spherical Filterglass

Phosphor (For curves, see front of this section) . 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 $22-7/16" \pm 3/8"$

Greatest width $18-11/16" \pm 1/8"$

Greatest height $14-15/16" \pm 1/8"$

Diagonal $20-5/8" \pm 3/16"$

Neck length $7-1/2" \pm 3/16"$

Radius of curvature of faceplate (External surface) . . $40"$

Screen Dimensions (Minimum):

Greatest width $17-3/8"$

Greatest height $13-5/8"$

Diagonal $19-1/2"$

Projected area 224 sq. in.

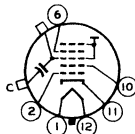
Operating Position Any

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—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

2IXP4-A



2IXP4-A

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
--	----------	---------

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

21YP4A

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC 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.	{ 750 max.	pf
	{ 500 min.	pf
Heater Current at 6.3 volts	600 ± 60	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.). 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:

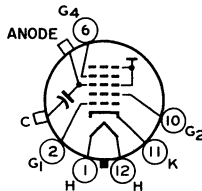
Type. Regular-Band
Contact area for grounding. Near Reference Line
For Additional Information on Coatings and Dimensions:

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 19800 max. volts

← indicates a change.



21YP4A

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. 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



21ZP4B

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.	} 750 max. pf 500 min. pf	
Heater Current at 6.3 volts		600 ± 60	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.). 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:

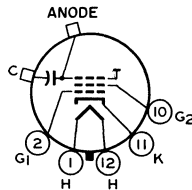
Type. Regular-Band
Contact area for grounding. Near Reference Line
For Additional Information on Coatings and Dimensions:

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 19800 max. volts
GRID-NO.2 VOLTAGE 550 max. volts

← Indicates a change.



21ZP4B

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:		
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



23AFP4

Picture Tube

**BIPANEL RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS**

**ALUMINIZED SCREEN
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	μf
Cathode to all other electrodes	5	μf
External conductive coating to ultor. .	{ 2500 max.	μf
	{ 2000 min.	μf
Electron Gun.	Type Requiring No Ion-Trap Magnet	

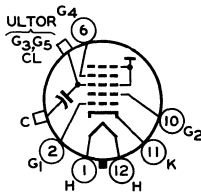
Optical:

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.	18-13/16" ± 7/16"
Neck Length	6" ± 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 <i>Picture-Tube Dimensional-Outlines</i> and <i>Bulb J187 D/G</i> sheets at the front of this section	
Cap	Recessed Small Cavity (JEDEC No. J1-21)
Base.	Short Small-Shel 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



23AFP4

Maximum and Minimum Ratings, Design-Maximum Values:

ULTOR VOLTAGE	{ 25000 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	20000	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



(

)

)

)

)

)

23AVP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
110° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

The 23AVP4 is the same as the 23CP4 except for the following item:

Optical:

Surface of Protective Panel. Treated to reduce specular reflection



(

)

)

)

)

)

23BDP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
92° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

The 23BDP4 is the same as the 23YP4 except for the following item:

Optical:

Surface of Protective Panel Treated to reduce
specular reflection



()

()

()

()

()

()

23BJP4

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 ± 30	ma
Heater Warm-Up Time (Average).	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes.	6	μf
Cathode to all other electrodes.	5	μf
External conductive coating to ultor	{2500 max. 1700 min.	{μf μf
Electron Gun	Type Requiring No Ion-Trap Magnet	

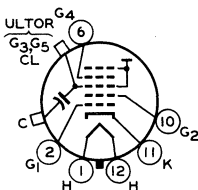
Optical:

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 <i>Picture-Tube Dimensional-Outlines</i> and <i>Bulb J187 C/F</i> 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.86-203)
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. 11000 min.	volts 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. 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 <i>ultor-to-grid No.1 voltage of</i>	20000	volts
and <i>grid-No.2-to-grid-No.1 voltage of</i>	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	

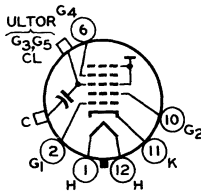
Optical:

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 <i>Picture-Tube Dimensional-Outlines</i> and <i>Bulb J187 D/G</i> 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.	volts
	{ 15000 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.	{ 225 max.	volts
	{ 40 min.	volts
	{ 70 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.		
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



23BLP4

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

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
LOW-VOLTAGE ELECTROSTATIC FOCUS**

**ALUMINIZED SCREEN
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.	μμf
	{ 2000 min.	μμf
Electron Gun	Type Requiring No Ion-Trap Magnet	

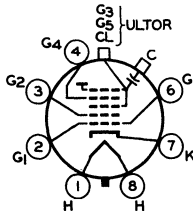
Optical:

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 <i>Picture-Tube Dimensional-Outlines</i> and <i>Bulb J187 A</i> 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. 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.	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

With Heater Having Controlled Warm-Up Time

The 23BTP4 is the same as the 23YP4 except for the following item:

Maximum and Minimum Ratings, Design-Maximum Values:

ULTOR VOLTAGE { 25000 max. volts
15000 min. volts



①

②

③

④

⑤

⑥

()

()

()

()

()

()

Picture Tube

**BI-PANEL RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS**

**ALUMINIZED SCREEN
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.	μμf
	{2000 min.	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"
---	---------	---------

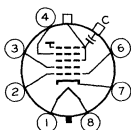
In plane of horizontal deflection	39-3/4"	26-1/2"
---	---------	---------



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. 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 anyultor voltage (E_{c5k}) between 12000[•] and 20000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 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 Adjust- able Centering Magnet [†]	0 to 8	gausses

Examples of Use of Design Ranges:

<i>With ultor voltage of</i>	18000	volts
<i>and grid-No.2 voltage of</i>	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



23CP4

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 [*]	0 to 400	volts
Cathode-to-Grid-No.1 Volt- age (E_{kg1}) for visual ex- tinction 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	μ a
Grid-No.2 Current	-15 to +15	μ a
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.

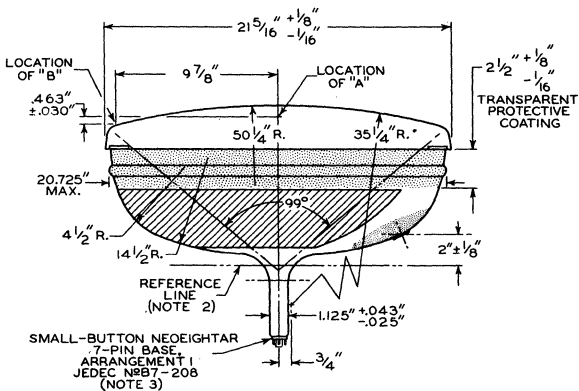
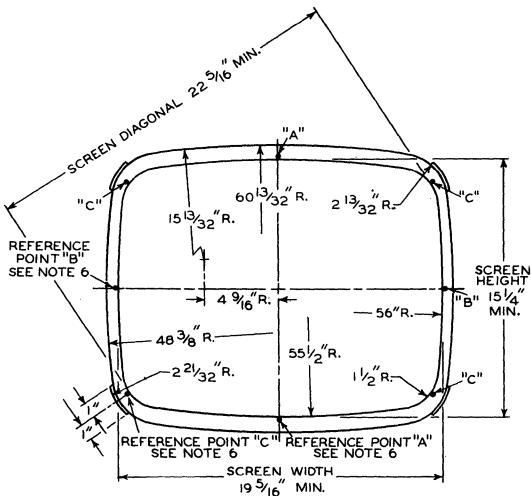


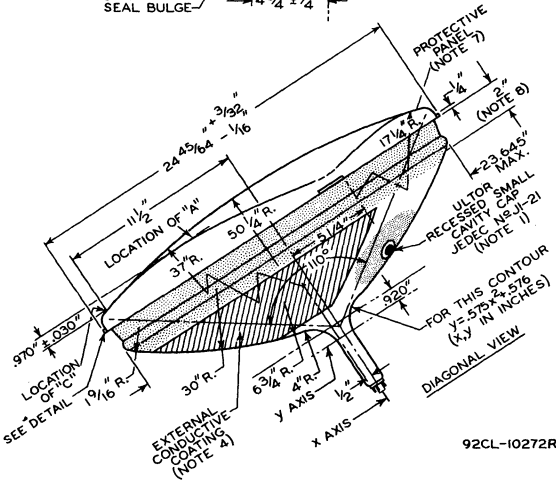
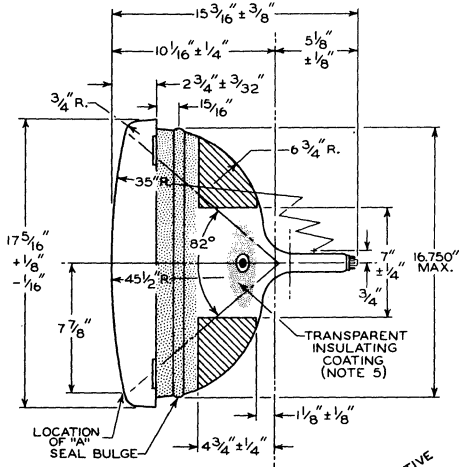
- ◆ Distance from *Reference Line* for suitable PM centering magnet should not exceed $2\text{-}1/4"$. Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a $3/8$ -inch radius concentric with the center of the tube face. It is to be noted that the 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*



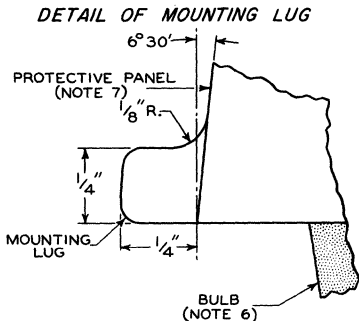
23CP4





92CL-10272RI





NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME 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 LINTLESS CLOTH.

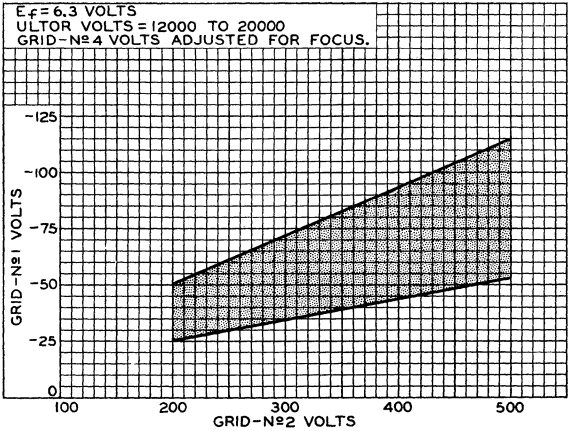
NOTE 6: REFERENCE POINTS A, B, AND C ARE PROVIDED FOR USE IN DESIGN OF A MASK CONTOURED FOR CLOSE FIT TO THE PROTECTIVE PANEL.

NOTE 7: THE CENTER OF THE PROTECTIVE PANEL MAY BE ECCENTRIC WITH RESPECT TO THE AXIS OF THE TUBE ENVELOPE. ASSOCIATED SHIFT OF THE PROTECTIVE PANEL ALONG ITS MINOR AND/OR MAJOR AXIS WILL NOT EXCEED 1/16".

NOTE 8: KEEP THIS CIRCUMFERENTIAL AREA FREE OF MOUNTING HARDWARE.

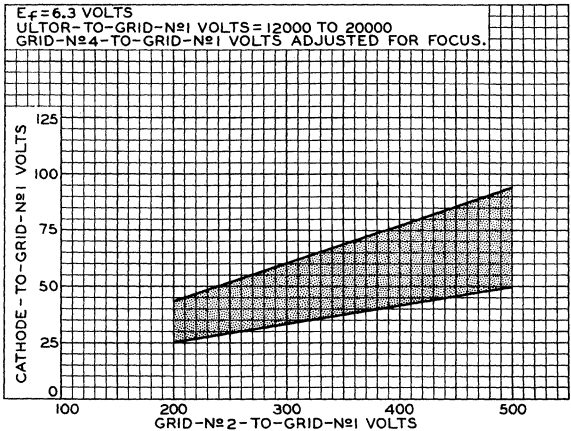
NOTE 9: ADEQUATE TUBE SUPPORT IS OBTAINED BY CLAMPING TO THE MOUNTING LUGS PROVIDED AT EACH CORNER OF THE PROTECTIVE PANEL. TUBE MOUNTING AND YOKE SUPPORT CLAMPS MUST BE SPACED FROM THE TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

RASTER-CUTOFF-RANGE CHARTS Grid-Drive Service



92CS-10312

Cathode-Drive Service



92CS-10313



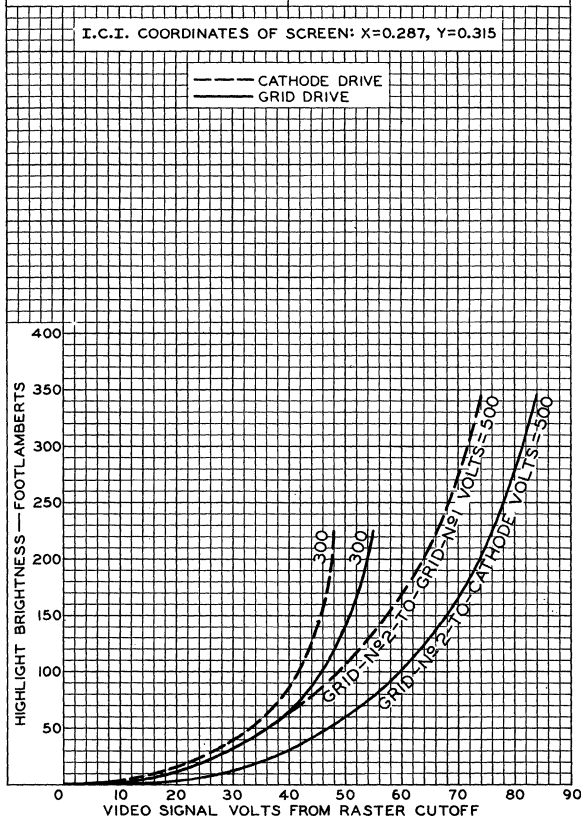
23CP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
$E_f = 6.3$ VOLTS	$E_f = 6.3$ VOLTS
ULTOR-TO-GRID- N_{g1} VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID N_{g1} TO GIVE FOCUSED RASTER CUTOFF.	GRID N_{g1} 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 13 1/2"	RASTER SIZE = 18" x 13 1/2"

I.C.I. COORDINATES OF SCREEN: X=0.287, Y=0.315

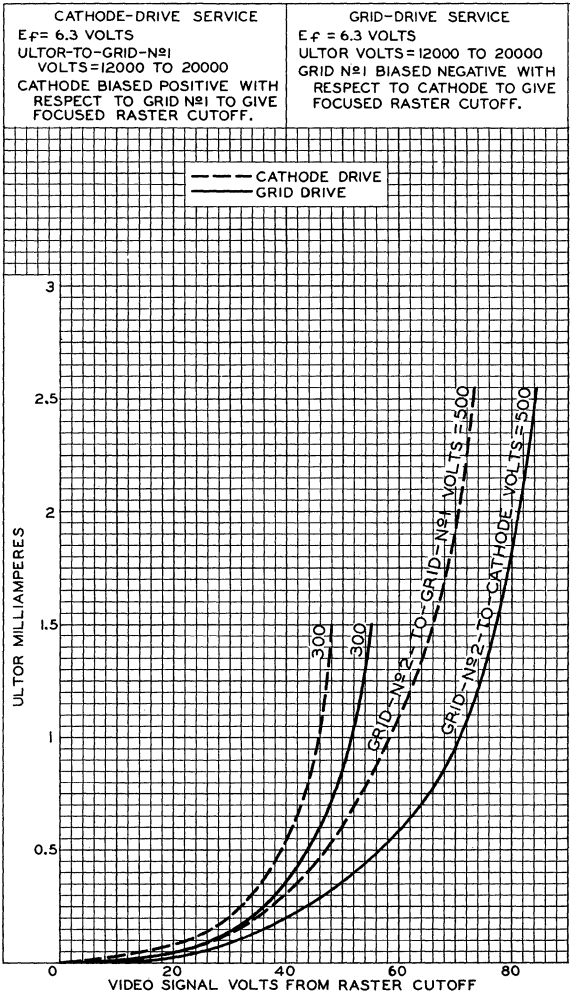
--- CATHODE DRIVE
— GRID DRIVE



92CM-10318



AVERAGE DRIVE CHARACTERISTICS



92CM-10317



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



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	μf
Cathode to all other electrodes.	5	μf
External conductive coating to ultor	{ 2500 max. 1700 min.	{ μf μf

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"

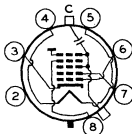


23EP4

	<i>Radius at center</i>	<i>Radius at edge</i>
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.	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.		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	μ a
Grid-No. 2 Current	-15 to +15	μ a
Field Strength of Adjustable Centering Magnet \blacklozenge	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

- \blacktriangle 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.
- \bullet 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.
- \star 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.
- \blacklozenge 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.



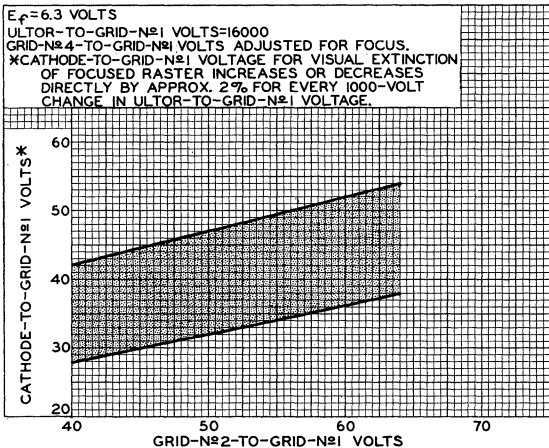
23EP4

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



RASTER-CUTOFF-RANGE CHART

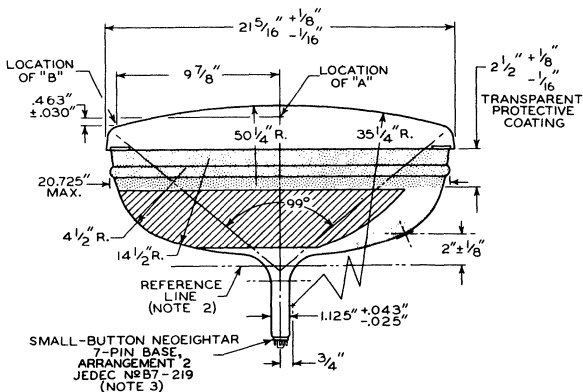
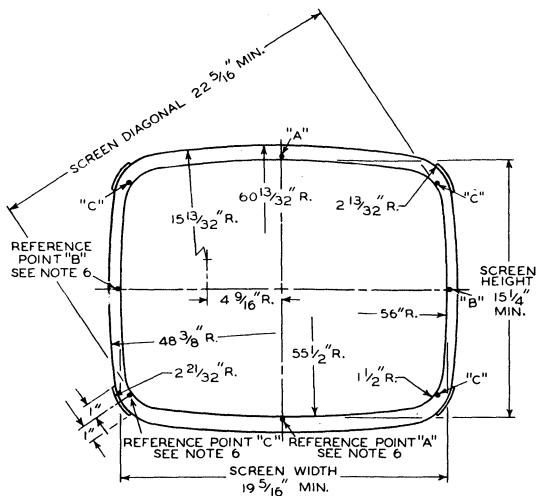
Cathode-Drive Service

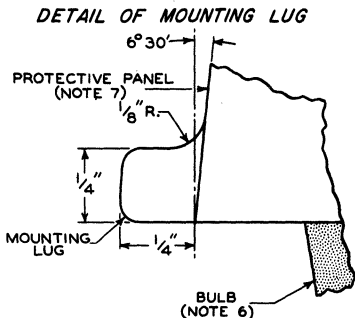


92CS-9945RI



23EP4





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 $\pm 30^\circ$. 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 GROUND.

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.

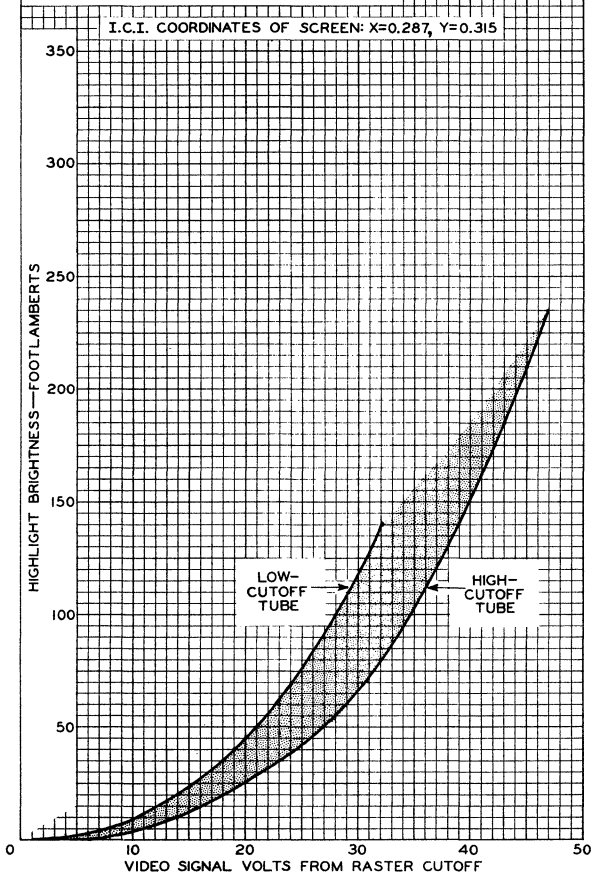
NOTE 7: THE CENTER OF THE PROTECTIVE PANEL MAY BE ECCENTRIC WITH RESPECT TO THE AXIS OF THE TUBE ENVELOPE. ASSOCIATED SHIFT OF THE PROTECTIVE PANEL ALONG ITS MINOR AND/OR MAJOR AXIS WILL NOT EXCEED 1/16".

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

$E_f = 6.3$ 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=18" x 13-1/2"



92CM-10314RI

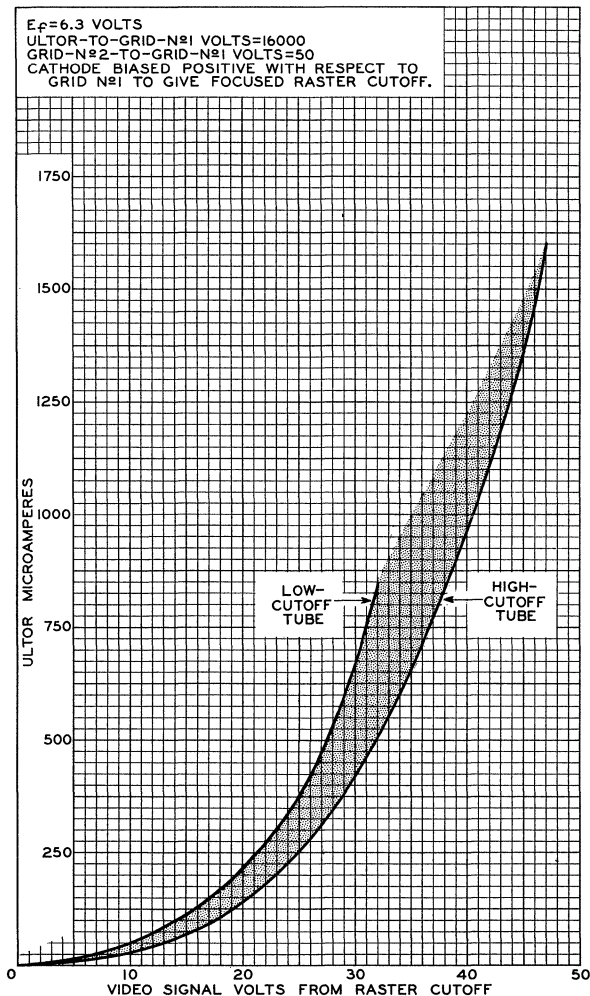


RADIO CORPORATION OF AMERICA
 Electron Tube Division
 Harrison, N. J.

DATA 5
 8-60

23EP4

CATHODE-DRIVE CHARACTERISTICS



92CM-9946R1



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



23JP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS
LOW-GRID-NO.2 VOLTAGE

ALUMINIZED SCREEN
110° MAGNETIC DEFLECTION
CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Direct Interelectrode Capacitances:

Cathode to all other electrodes	5	pf
Grid No.1 to all other electrodes	6	pf
External conductive coating to anode.	{ 2500 max.	pf
	{ 2000 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 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:

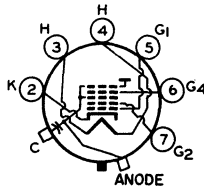
Type Regular-Band
Contact area for grounding. Near Reference Line

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

**RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS**

**ALUMINIZED SCREEN
MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts.	600 ± 30	ma
Heater Warm-Up Time (Average).	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes.	6	μf
Cathode to all other electrodes.	5	μf
External conductive coating to ultor	{ 2500 max. 1700 min.	{ μf μf
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):			
	<i>Center</i>	<i>Intermediate</i>	<i>Edge</i>
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°)		

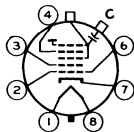


23MP4

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^A 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 <i>Raster-Cutoff-Range Chart for Grid-Drive Service</i>	
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	μ a
Grid-No.2 Current.	-15 to +15	μ a
Field Strength of Adjustable Centering Magnet*.	0 to 8	gausses

Examples of Use of Design Ranges:

<i>With ultor voltage of</i>	18000	volts
<i>and grid-No.2 voltage of</i>	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-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
--	----------	-------



23MP4

Cathode-to-Grid-No.1 Voltage ($E_{k_{g1}}$) for visual extinction of focused raster.	See <i>Raster-Cutoff-Range Chart for Cathode-Drive Service</i>	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative).	Same value as determined for $E_{k_{g1}}$ except video drive is a negative voltage	
Grid-No.4 Current.	-25 to +25	μ a
Grid-No.2 Current.	-15 to +15	μ a
Field Strength of Adjustable Centering Magnet*.	0 to 8	gausses

Examples of Use of Design Ranges:

<i>With ultor-to-grid- No.1 voltage of</i>	18000	volts
<i>and grid-No.2-to- grid-No.1 voltage of</i>	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 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



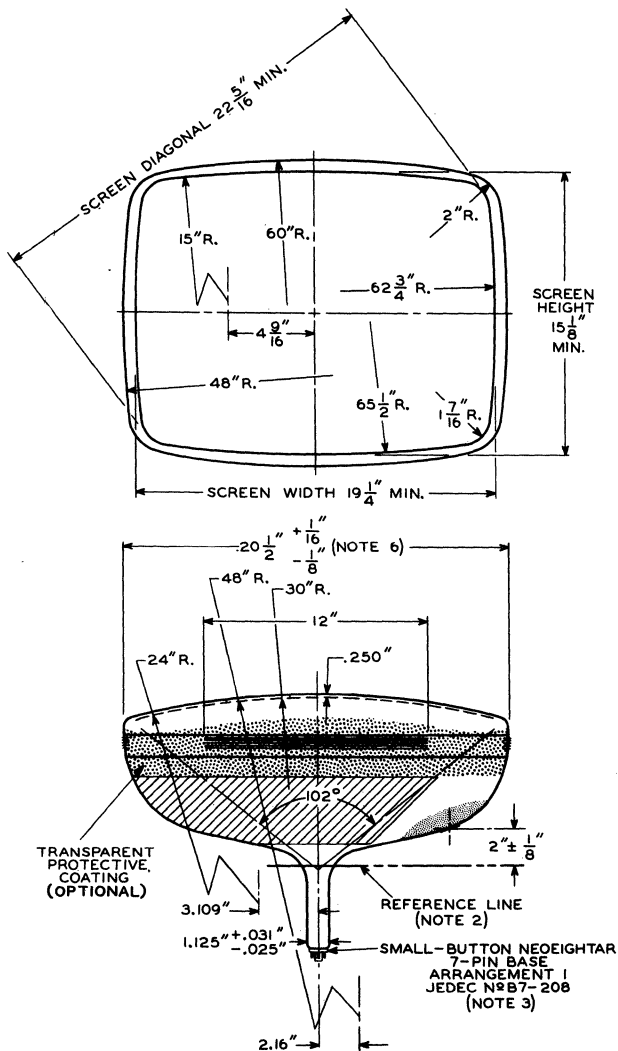
23MP4

exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

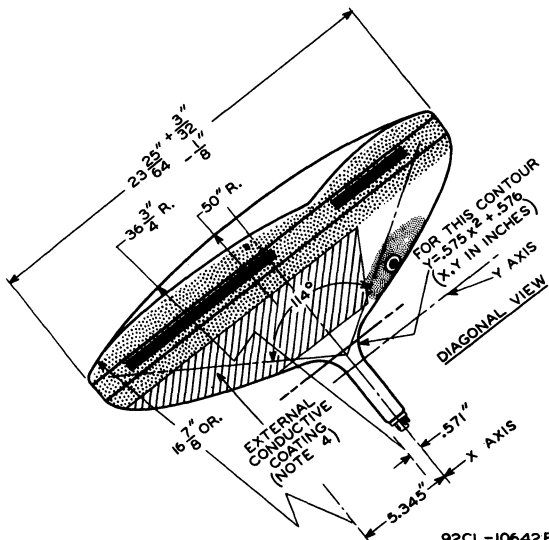
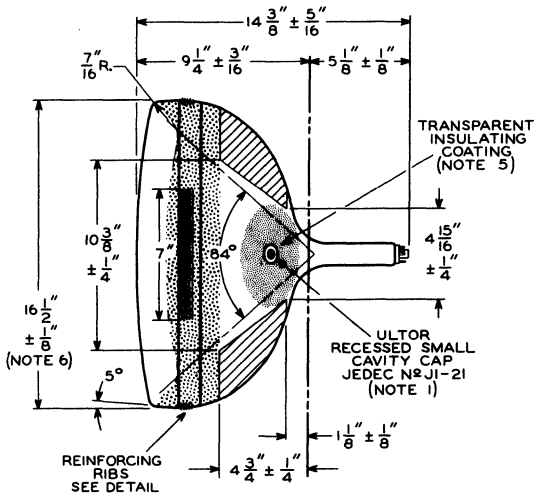
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatterproof, glass cover over the face of this picture tube to protect it from being struck accidentally and to protect against possible damage resulting from tube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



23MP4



23MP4



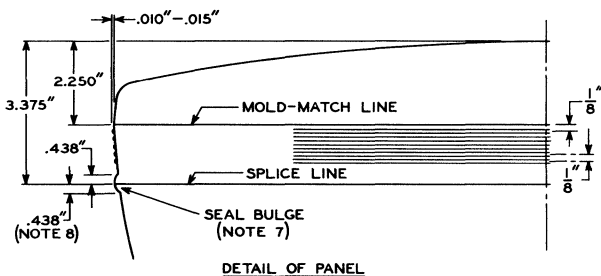
92CL-10642RI



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

DATA 4
10-60

23MP4



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME 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.

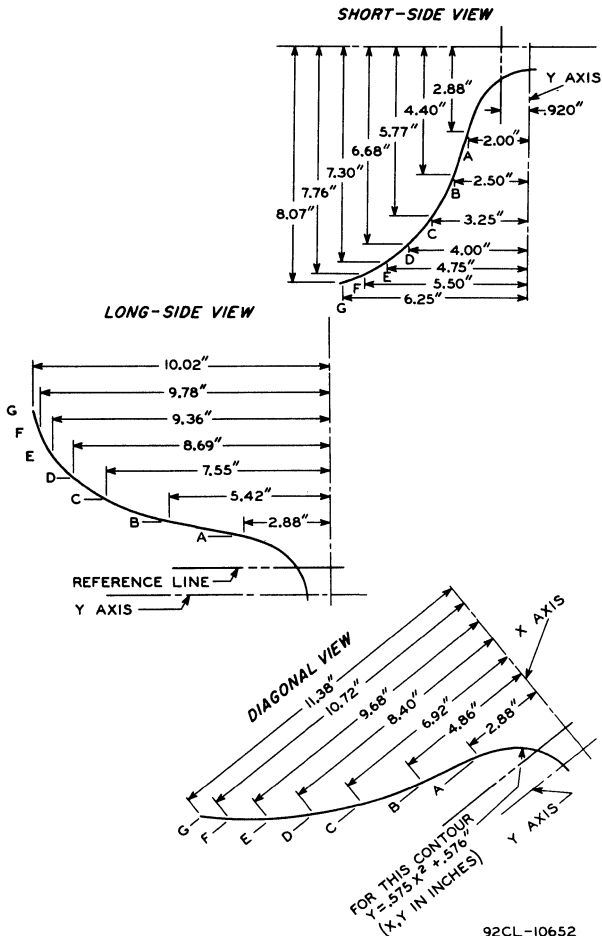
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

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 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

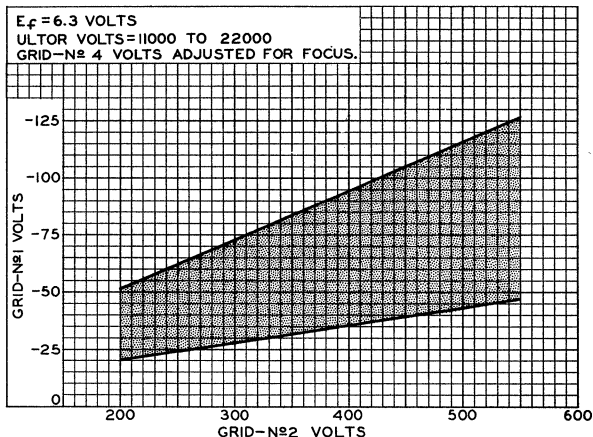


NOTE: PLANES A THRU G ARE NORMAL TO THE TUBE AXIS AND AT FIXED LOCATIONS FROM THE Y AXIS. THESE COORDINATES DESCRIBE THE BOGIE-BULB EXTERNAL CONTOUR IN PLANES THROUGH THE TUBE AXIS AND THE RESPECTIVE FACEPLATE AXES.



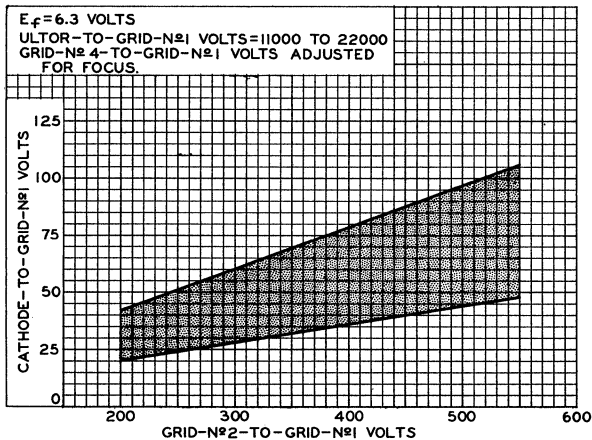
23MP4

RASTER-CUTOFF-RANGE CHARTS Grid-Drive Service



92CS-10620RI

Cathode-Drive Service



92CS-10621RI

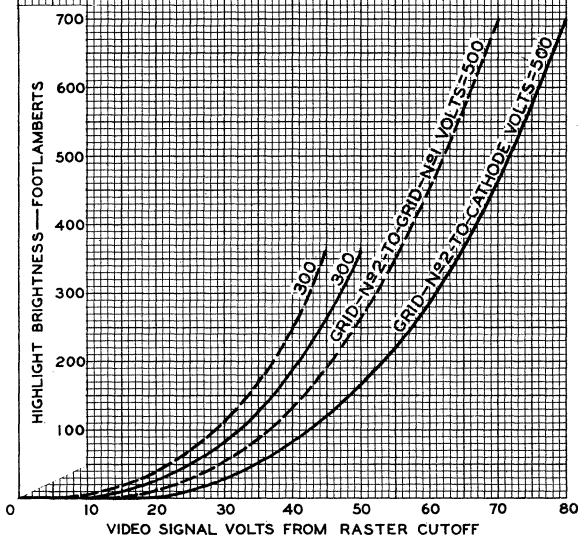


AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
$E_f = 6.3$ VOLTS	$E_f = 6.3$ VOLTS
ULTOR-TO-GRID-N ₁ VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID N ₁ TO GIVE FOCUSED RASTER CUTOFF.	GRID N 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

--- CATHODE DRIVE
 — GRID DRIVE

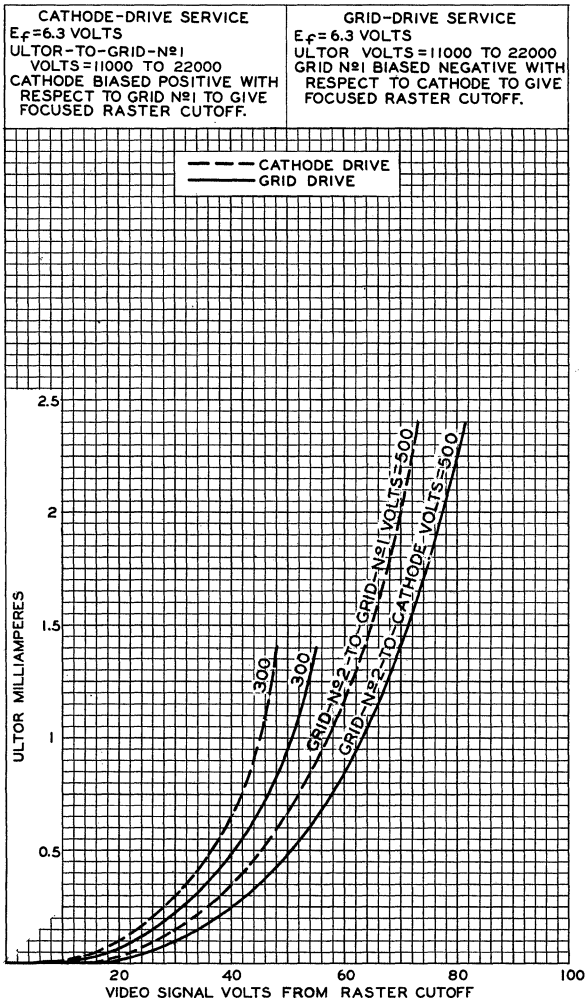


92CM-10625



23MP4

AVERAGE DRIVE CHARACTERISTICS



92CM-10618



23UP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
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	μf
Cathode to all other electrodes	5	μf
External conductive coating to ultor.	{ 2500 max. 2000 min.	{ μf μf
Electron Gun.	Type Requiring	No Ion-Trap Magnet

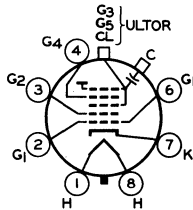
Optical:

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 <i>Picture-Tube Dimensional-Outlines</i> and <i>Bulb J187 A</i> 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



23UP4

Maximum and Minimum Ratings, Design-Maximum Values:

ULTOR VOLTAGE	{18000 max. 10000 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
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 <i>ultor voltage of</i>	16000	volts
and <i>grid-No.2 voltage of</i>	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



23YP4

Picture Tube

**BI-PANEL RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS**

**ALUMINIZED SCREEN
92° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

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 μμf
Electron Gun.	Type Requiring No Ion-Trap Magnet	

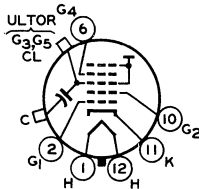
Optical:

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 <i>Picture-Tube Dimensional-Outlines</i> and <i>Bulb J187 D/G</i> 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



24AEP4

Picture Tube

**RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS**

**ALUMINIZED SCREEN
90° 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	μf
Cathode to all other electrodes	5	μf
External conductive coating to ultor.	{ 2500 max. 2000 min.	{ μf μf
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.	19-1/8" ± 3/8"
Neck Length.	5-1/2" ± 3/16"
Projected Area of Screen.	332 sq. in.

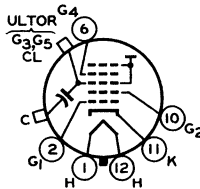
External Conductive Coating:
 Type. Special
 Contact area for grounding. Near Reference Line

For Additional Information on Coatings and Dimensions:
 See *Picture-Tube Dimensional-Outlines* and *Bulb J192 A/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



24AEP4

Maximum Ratings, Design-Maximum Values:

ULTOR 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 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	18000	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.	-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



24AHP4



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. volts	
GRID-No.4 VOLTAGE:	{ 12000*min. volts	
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_{c5k}) between 12000 and 20000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts

Grid-No.4 Voltage for Focus [§]	-50 to +350	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	μ a
Grid-No.2 Current	-15 to +15	μ a
Field Strength of Adjustable Centering Magnet*.	0 to 8	gausses

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	-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.



24AHP4

PICTURE TUBE

24AHP4

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.	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 ($E_{c_5g_1}$) 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 \S	-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.

* \S : See next page.



24AHP4

PICTURE TUBE

Cathode-to-Grid-No.1
Voltage (E_{k_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_{k_1} except video drive is a
negative voltage

Grid-No.4 Current. -25 to +25 μ a
Grid-No.2 Current. -15 to +15 μ a
Field Strength of Adjust-
able 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 . . -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



24AHP4

RASTER-CUTOFF-RANGE CHART

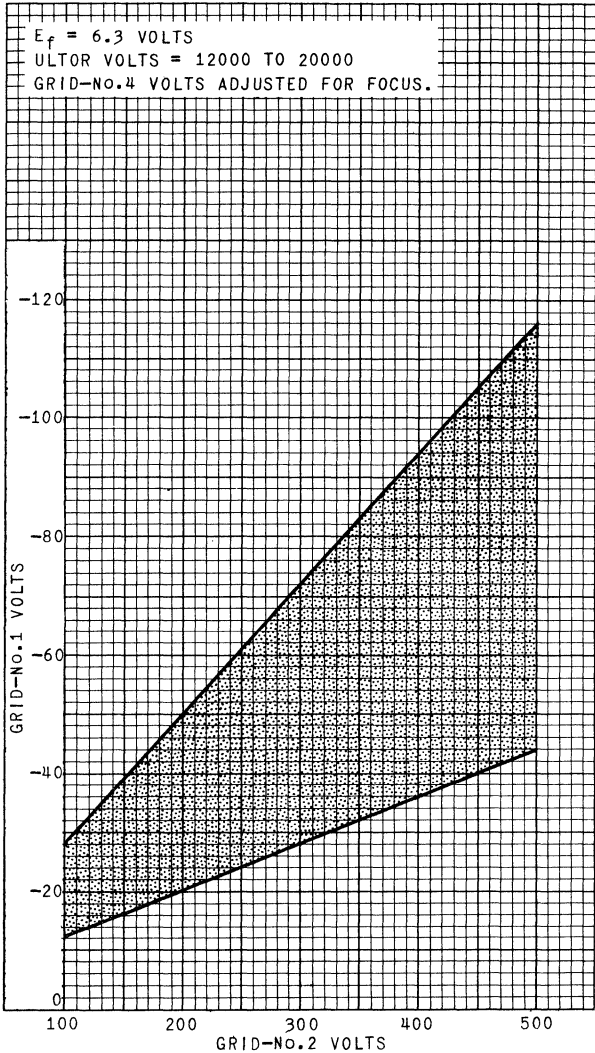
For Grid-Drive Service

24AHP4

$E_f = 6.3$ VOLTS

ULTOR VOLTS = 12000 TO 20000

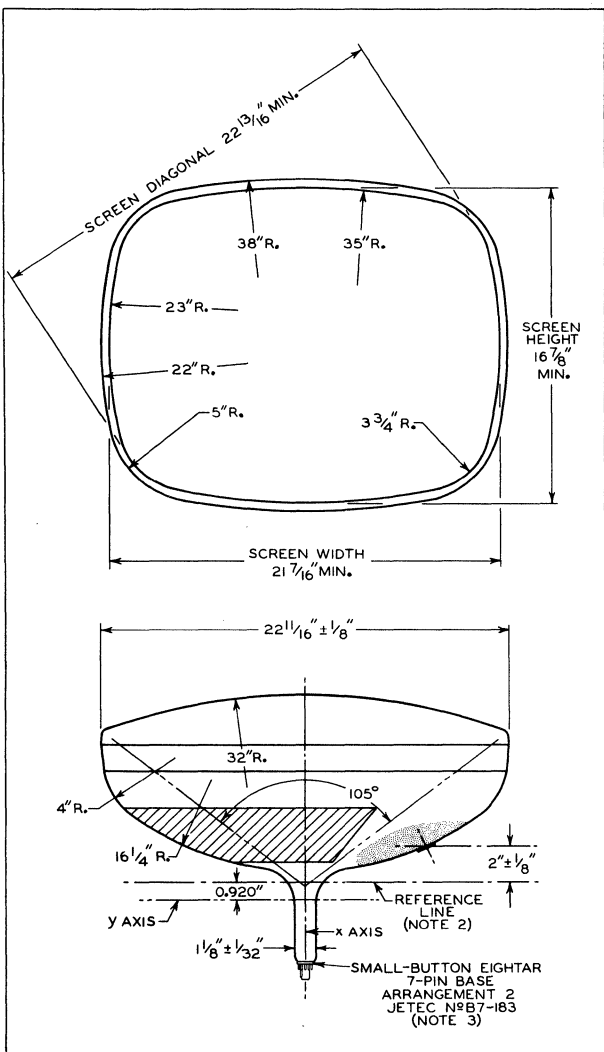
GRID-No.4 VOLTS ADJUSTED FOR FOCUS.



24AHP4



24AHP4 PICTURE TUBE

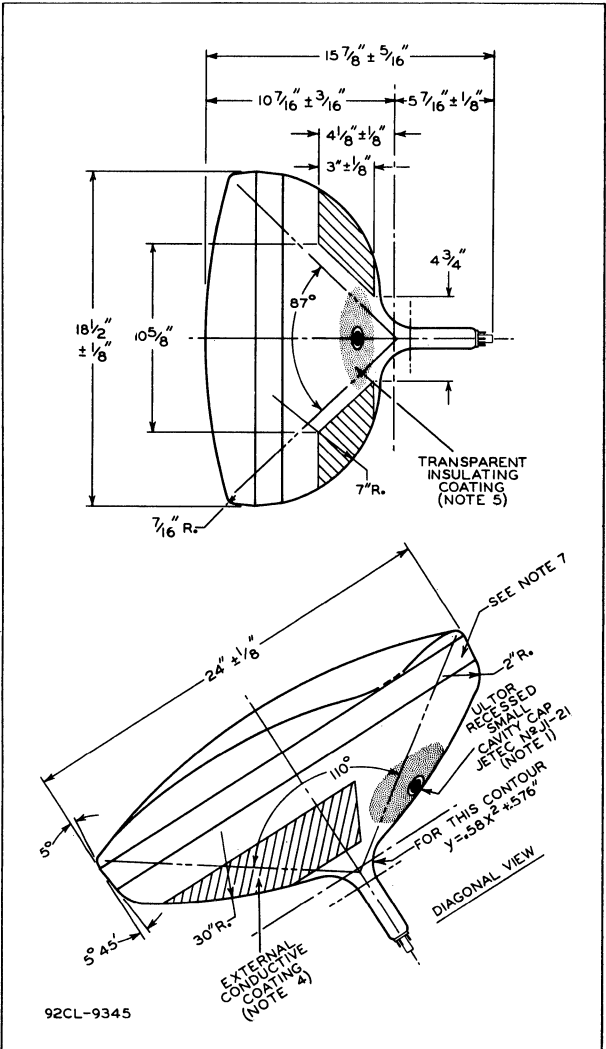




24AHP4

PICTURE TUBE

24AHP4

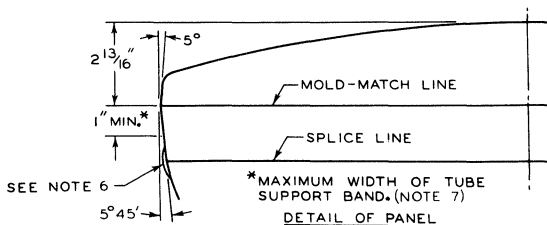


24AHP4



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 $\pm 30^\circ$. 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.



24AHP4

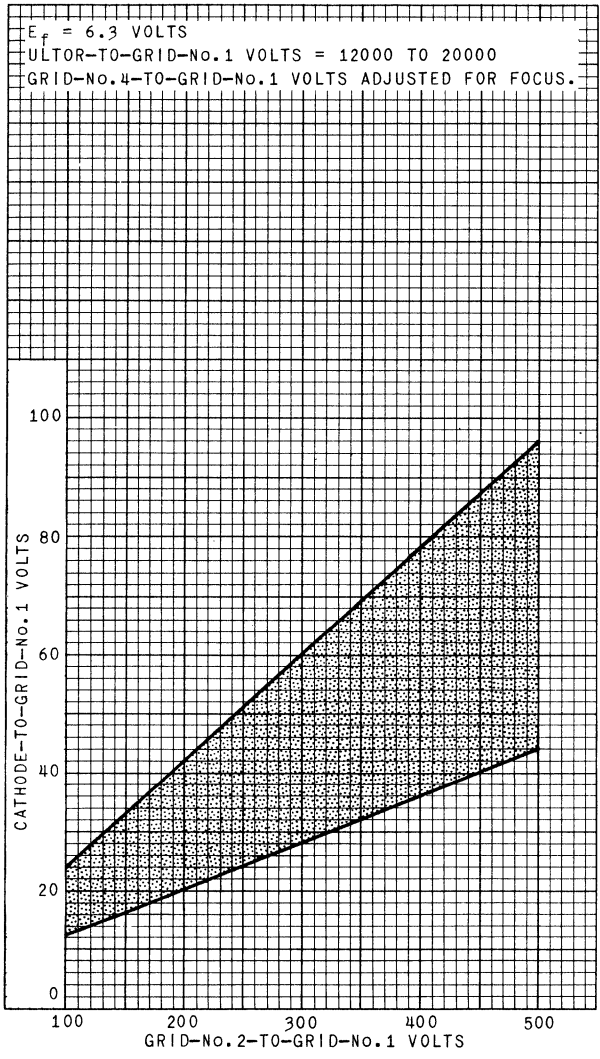
24AHP4

RASTER-CUTOFF-RANGE CHART For Cathode-Drive Service

$E_f = 6.3$ VOLTS

ULTOR-TO-GRID-No.1 VOLTS = 12000 TO 20000

GRID-No.4-TO-GRID-No.1 VOLTS ADJUSTED FOR FOCUS.



24AHP4

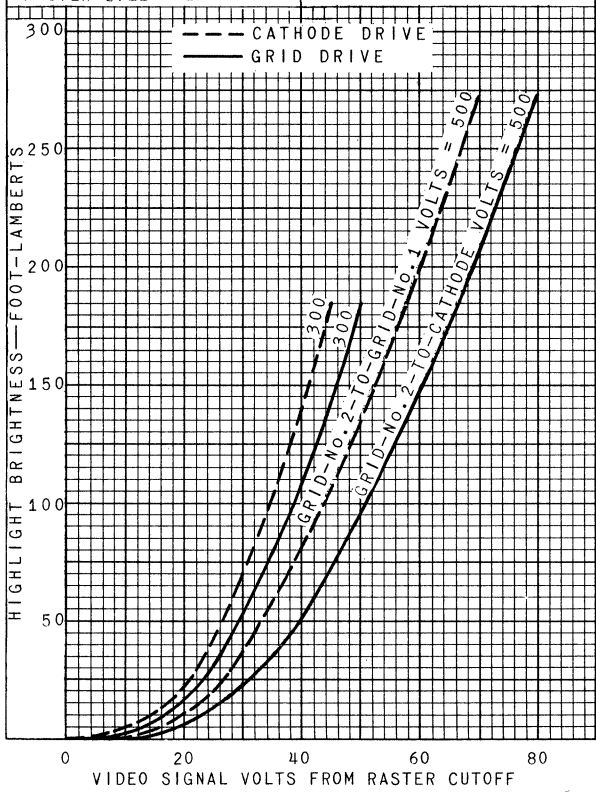


24AHP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE
 $E_f = 6.3$ VOLTS
 ULTOR-TO-GRID-No.1
 VOLTS = 16000
 CATHODE BIASED POSITIVE
 WITH RESPECT TO GRID
 No.1 TO GIVE FOCUSED
 RASTER CUTOFF.
 RASTER FOCUSED
 AT AVERAGE BRIGHTNESS.
 RASTER SIZE = 21" x 16"

GRID-DRIVE SERVICE
 $E_f = 6.3$ VOLTS
 ULTOR VOLTS = 16000
 GRID No.1 BIASED NEGA-
 TIVE WITH RESPECT TO
 CATHODE TO GIVE
 FOCUSED RASTER CUTOFF.
 RASTER FOCUSED
 AT AVERAGE BRIGHTNESS.
 RASTER SIZE = 21" x 16"



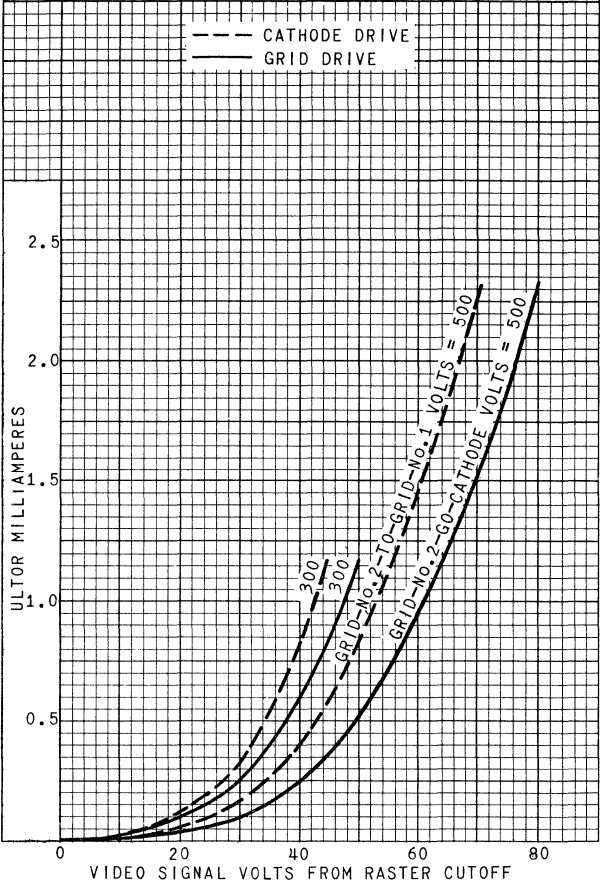


24AHP4

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.



○

○

○

○

○

○

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	$\mu\mu\text{f}$
Cathode to all other electrodes	5	$\mu\mu\text{f}$
External conductive coating to ultor. .	{ 2500 max.	$\mu\mu\text{f}$
	{ 2000 min.	$\mu\mu\text{f}$

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" \pm 3/8"

Greatest width. 22-11/16" \pm 1/8"

Greatest height 18-7/16" \pm 1/8"

Diagonal. 24" \pm 1/8"

Neck length 5-1/2" \pm 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

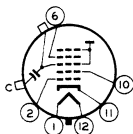
Base. Small-Shell Duodecal 6-Pin, Arrangement 1,
(JEDEC Group 4, No. B6-63)



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_{c5g1}) between 12000 and 20000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 40 and 68 volts*

Grid-No.4-to-Grid-No.1 Voltage for focus ^S	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg1}) for visual extinction of focused raster ^A	See <i>Raster-Cutoff-Range Chart for Cathode-Drive Service</i>	
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	μ a
Grid-No.2 Current	-15 to +15	μ a
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	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_{kG1}) 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.

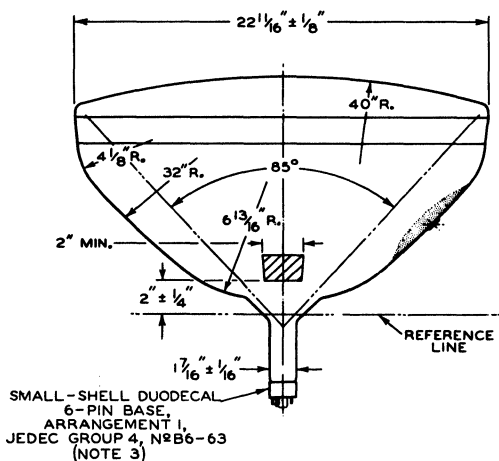
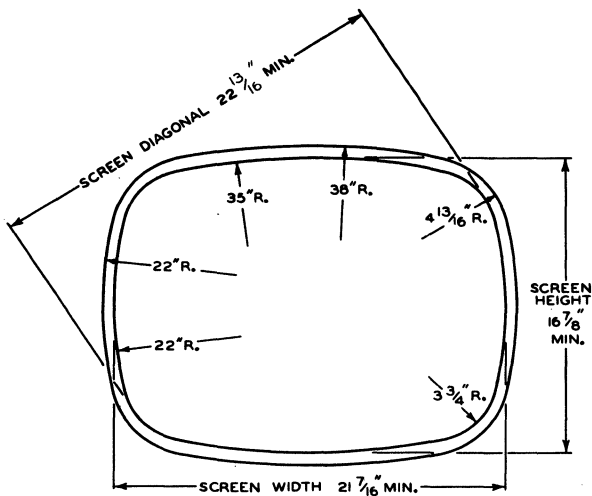
OPERATING CONSIDERATIONS

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.

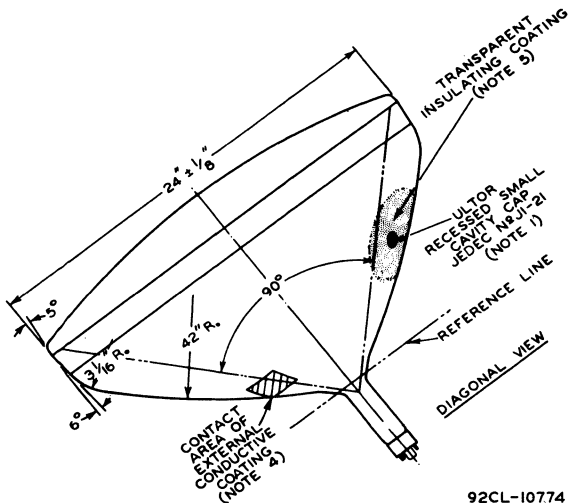
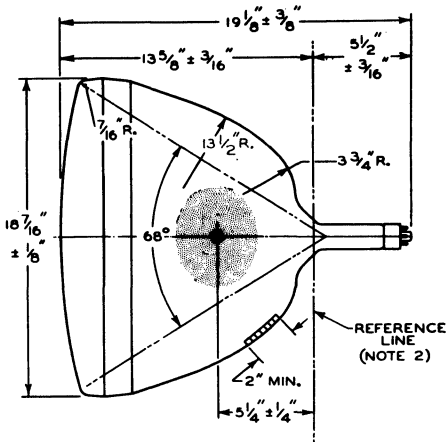
*For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section*



24ATP4



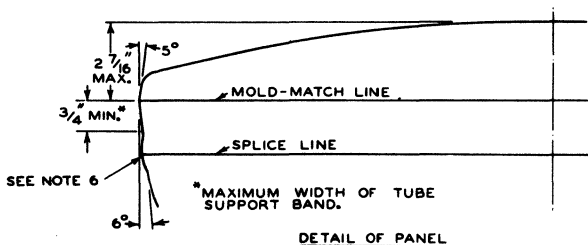
24ATP4



92CL-10774



24ATP4



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No. G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE 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 $2\text{-}\frac{3}{4}$ ".

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.

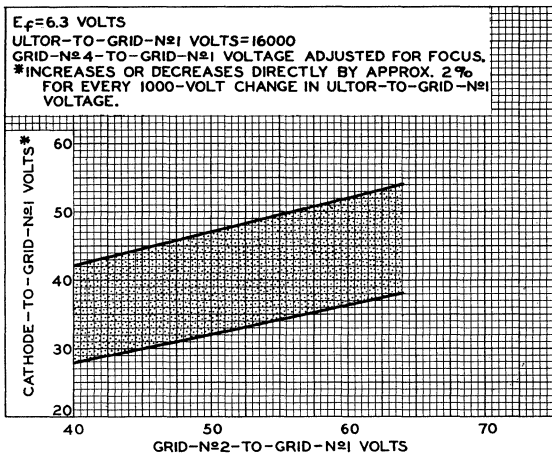
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN $\frac{1}{8}$ ", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN $\frac{1}{16}$ " BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.



RASTER-CUTOFF-RANGE CHART

Cathode-Drive Service



92CS-10765



24AUP4

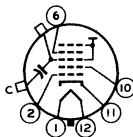


24AUP4

PICTURE TUBE

Basing Designation for BOTTOM VIEW12L

- 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. 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_{c5k}) between 12000 and 20000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus [§]	-75 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 μ a

[▲], [‡], [§]: See next page.



24AUP4

PICTURE TUBE

24AUP4

Grid-No.2 Current.	-15 to +15	μ a
Field Strength of Adjustable Centering Magnet†.	0 to 8	gausses

Examples of Use of Design Ranges:

<i>With ultor voltage of</i>	18000	volts
<i>and grid-No.2 voltage of</i>	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.



24AUP4

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	μ a
Grid-No.2 Current	-15 to +15	μ a
Field Strength of Adjustable Centering Magnet†	0 to 8	gausses

Examples of Use of Design Ranges:

<i>With ultor-to-grid-No.1 voltage of</i>	18000	volts
<i>and grid-No.2-to-grid-No.1 voltage of</i>	300	volts
Grid-No.4-to-Grid-No.1 Voltage for focus	-75 to +40C	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*

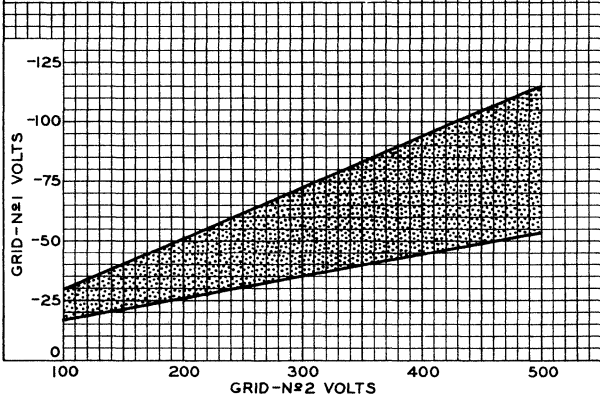


24AUP4

24AUP4

RASTER-CUTOFF-RANGE CHARTS GRID-DRIVE SERVICE

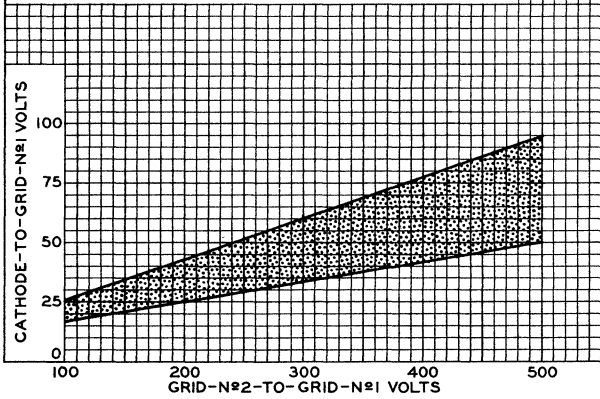
$E_f = 6.3$ VOLTS
ULTOR VOLTS = 12000 TO 20000
GRID-N#4 VOLTS ADJUSTED FOR FOCUS.



92CS-9919

CATHODE-DRIVE SERVICE

$E_f = 6.3$ VOLTS
ULTOR-TO-GRID-N#1 VOLTS = 12000 TO 20000
GRID-N#4-TO-GRID-N#1 VOLTS ADJUSTED FOR FOCUS.



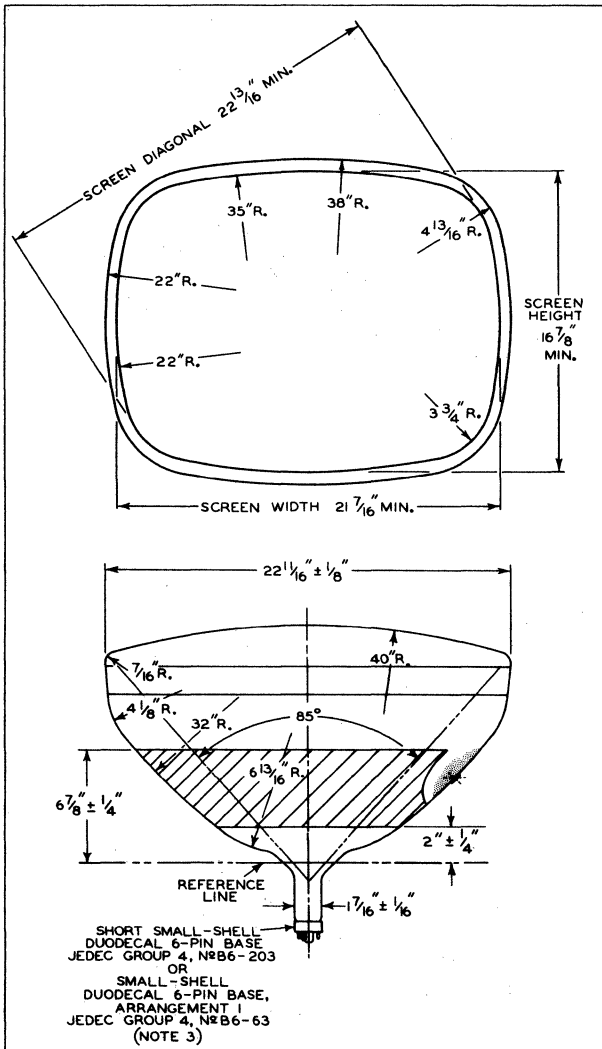
92CS-9918

24AUP4



24AUP4

PICTURE TUBE

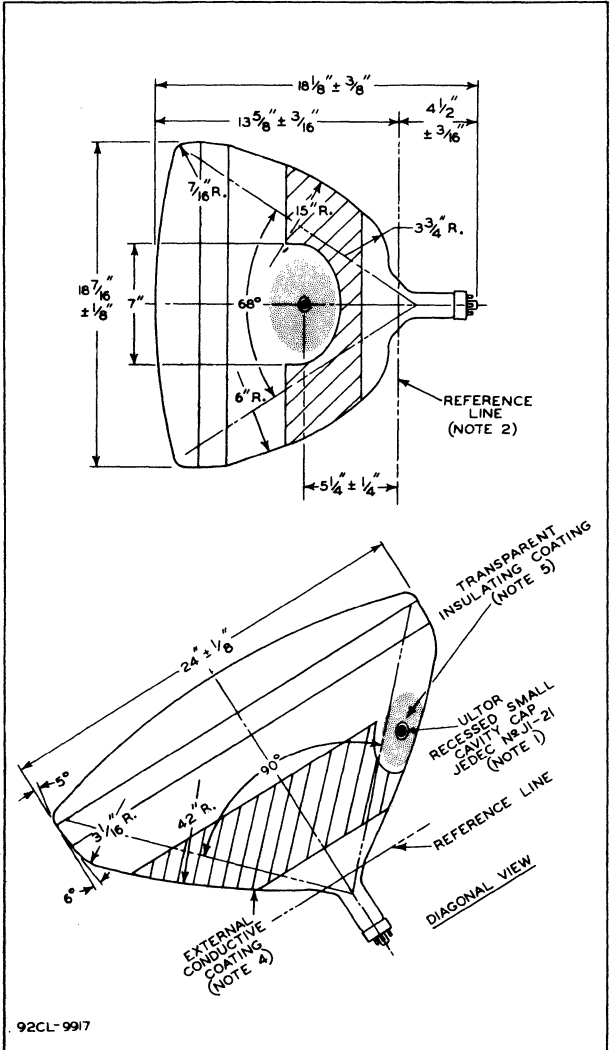




24AUP4

PICTURE TUBE

24AUP4



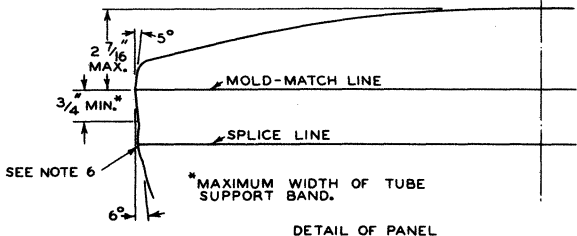
92CL-9917

24AUP4



24AUP4

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 $\pm 30^\circ$. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No. G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE 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: 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.

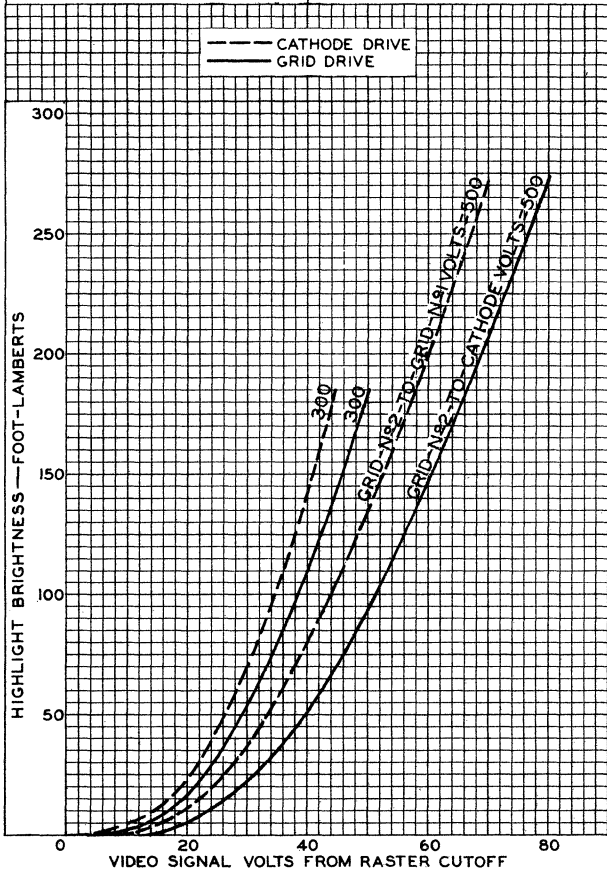


24AUP4

24AUP4

AVERAGE DRIVE CHARACTERISTICS

<p>CATHODE-DRIVE SERVICE $E_f = 6.3$ VOLTS ULTOR-TO-GRID-N$\#$1 VOLTS = 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID N$\#$1 TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS. RASTER SIZE = 21" x 16"</p>	<p>GRID-DRIVE SERVICE $E_f = 6.3$ VOLTS ULTOR VOLTS = 16000 GRID N$\#$1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS. RASTER SIZE = 21" x 16"</p>
---	--



24AUP4

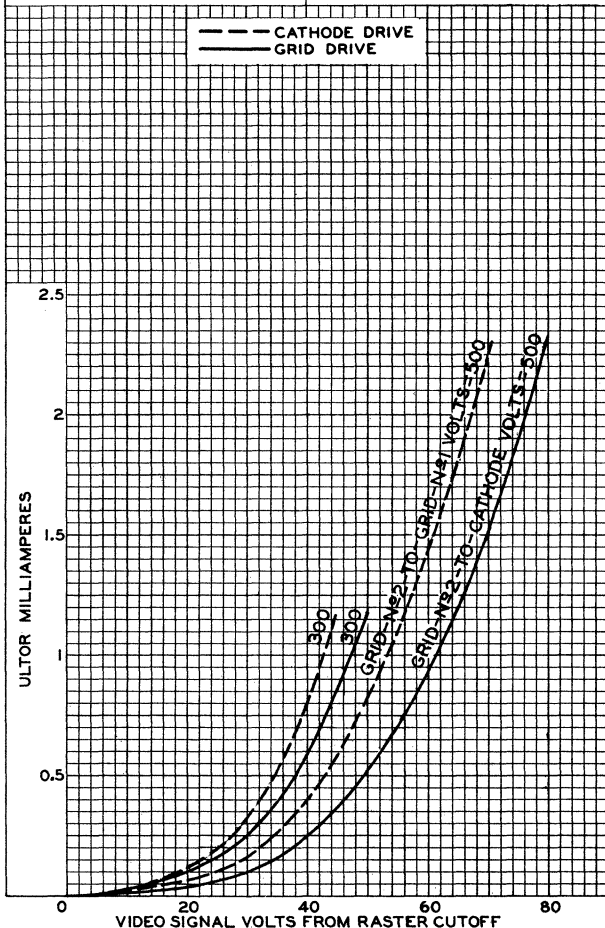


24AUP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-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.

GRID-DRIVE SERVICE
 $E_f = 6.3$ VOLTS
 ULTOR VOLTS = 12000 TO 20000
 GRID №1 BIASED NEGATIVE, WITH
 RESPECT TO CATHODE TO GIVE
 FOCUSED RASTER CUTOFF.





24BAP4 PICTURE TUBE

24BAP4

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS
LOW GRID—No. 2 VOLTAGE

ALUMINIZED SCREEN
MAGNETIC DEFLECTION
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	$\mu\mu\text{f}$
Cathode to all other electrodes.	5	$\mu\mu\text{f}$
External conductive coating to ultor.	{ 2500 max.	$\mu\mu\text{f}$
	{ 1700 min.	$\mu\mu\text{f}$

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" \pm 5/16"

Greatest width 22-11/16" \pm 1/8"

Greatest height. 18-1/2" \pm 1/8"

Diagonal 24" \pm 1/8"

Neck length. 5-7/16" \pm 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.

24BAP4

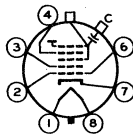


24BAP4

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—Ultror
 (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 400 volts
Cathode-to Grid-No.1 Voltage (E_{k1}) for visual extinc- tion 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_{k1} except video drive is a negative voltage
Grid-No.4 Current.	-25 to +25 μ a
Grid-No.2 Current.	-15 to +15 μ a
Field Strength of Adjustable Centering Magnet [▲]	0 to 8 gauss
	→ Indicates a change.



24BAP4

24BAP4

PICTURE TUBE

Examples of Use of Design Ranges:

<i>With ultor-to-grid-</i>			
<i>No. 1 voltage of</i>	16000	20000	<i>volts</i>
<i>and grid-No. 2-to-grid-</i>			
<i>No. 1 voltage of</i>	50	64	<i>volts</i>
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

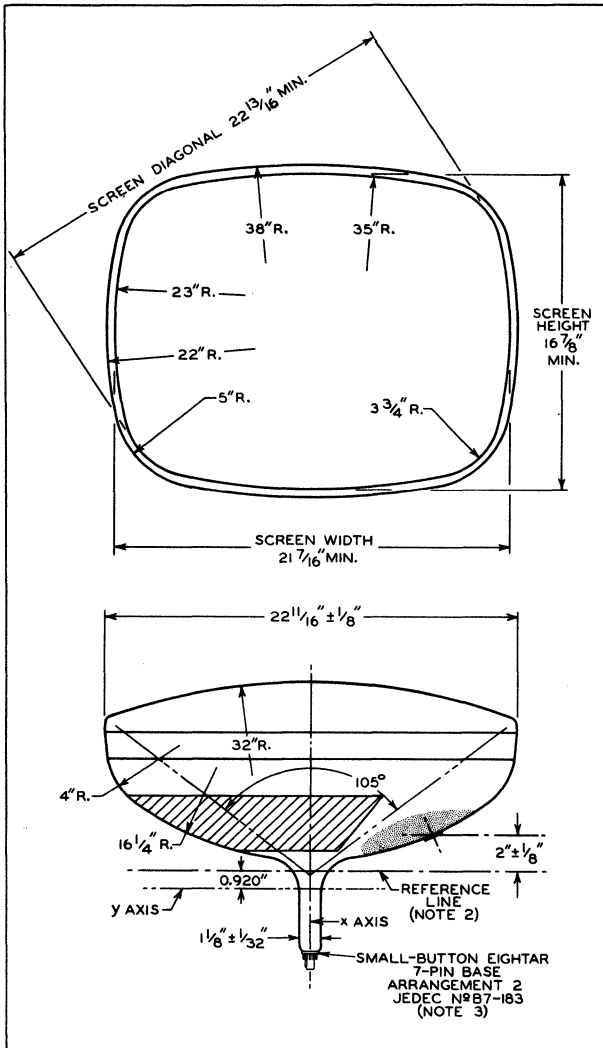
X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, the 24BAP4 does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 22 kilovolts (Absolute-maximum value), shielding of the 24BAP4 for X-ray radiation may be needed 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.

24BAP4



24BAP4 PICTURE TUBE

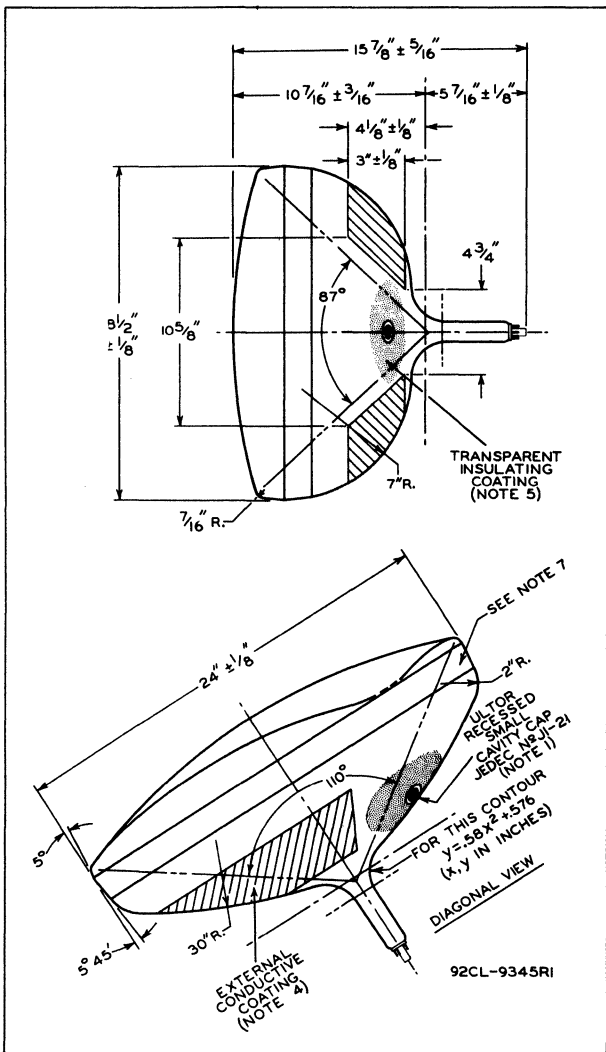




24BAP4

PICTURE TUBE

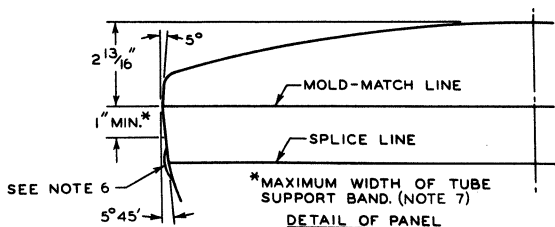
24BAP4





24BAP4

PICTURE TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^\circ$. 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.



24BAP4

24BAP4

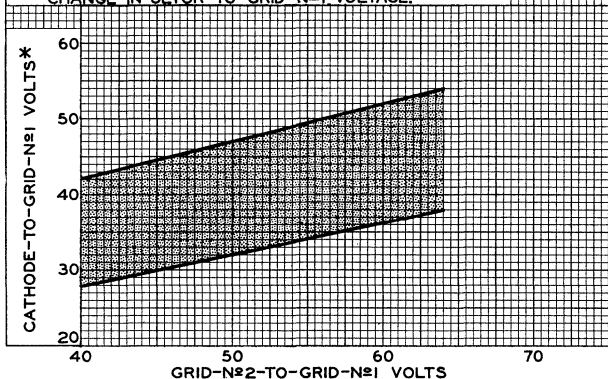
RASTER-CUTOFF-RANGE CHART

$E_f = 6.3$ VOLTS

ULTOR-TO-GRID-N^o1 VOLTS=16000

GRID-N^o4-TO-GRID-N^o1 VOLTS ADJUSTED FOR FOCUS.

*CATHODE-TO-GRID-N^o1 VOLTAGE FOR VISUAL EXTINCTION OF FOCUSED RASTER INCREASES OR DECREASES DIRECTLY BY APPROX. 2% FOR EVERY 1000-VOLT CHANGE IN ULTOR-TO-GRID-N^o1 VOLTAGE.



92CS-9945RI

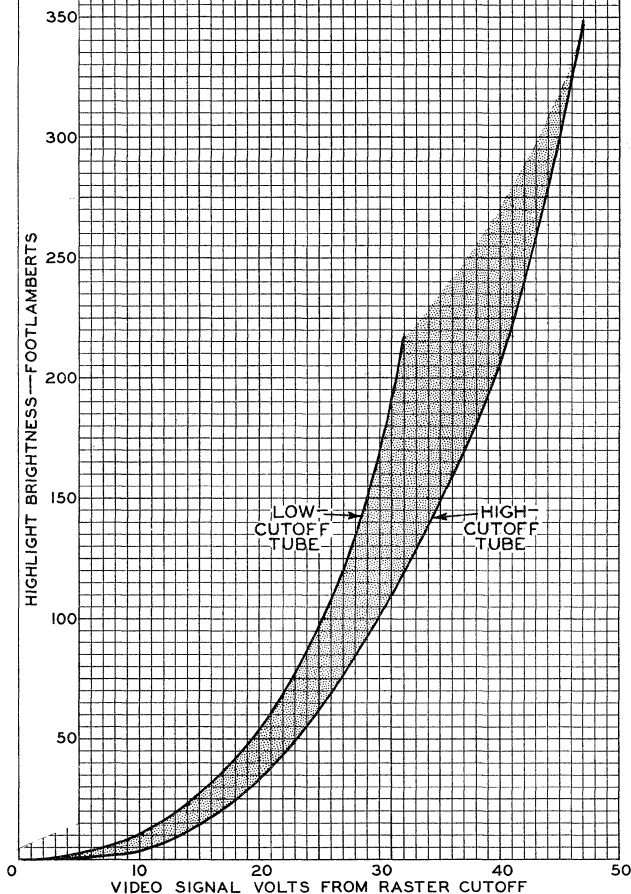
24BAP4



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: $X = 0.270$, $Y = 0.300$ 

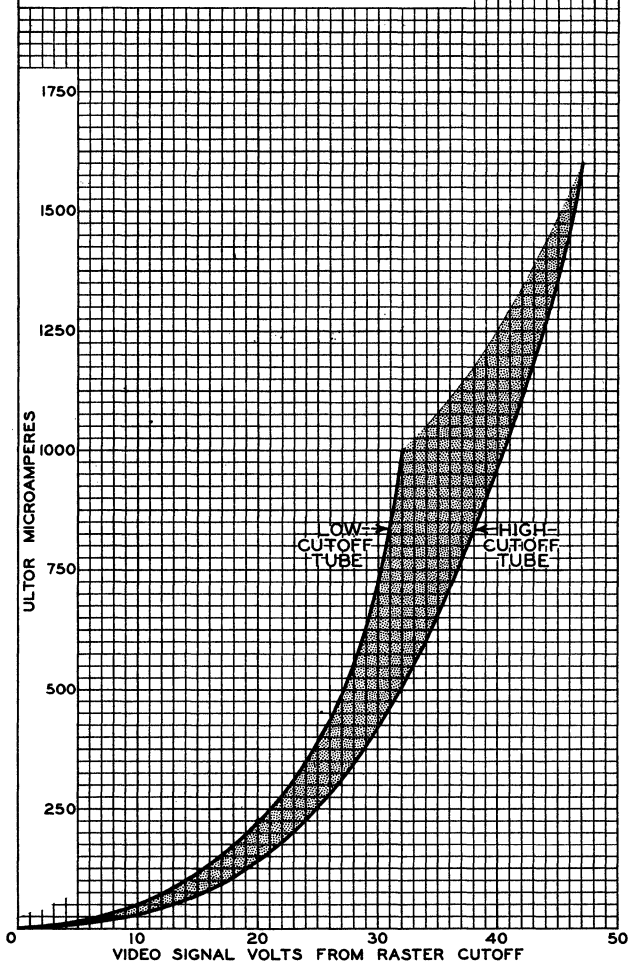


24BAP4

24BAP4

CATHODE-DRIVE CHARACTERISTICS

$E_f = 6.3$ VOLTS
ULTOR-TO-GRID-N $\#$ 1 VOLTS = 16000
GRID-N $\#$ 2-TO-GRID-N $\#$ 1 VOLTS = 50
CATHODE BIASED POSITIVE WITH RESPECT TO
GRID N $\#$ 1 TO GIVE FOCUSED RASTER CUTOFF.



0

0

0

0

0

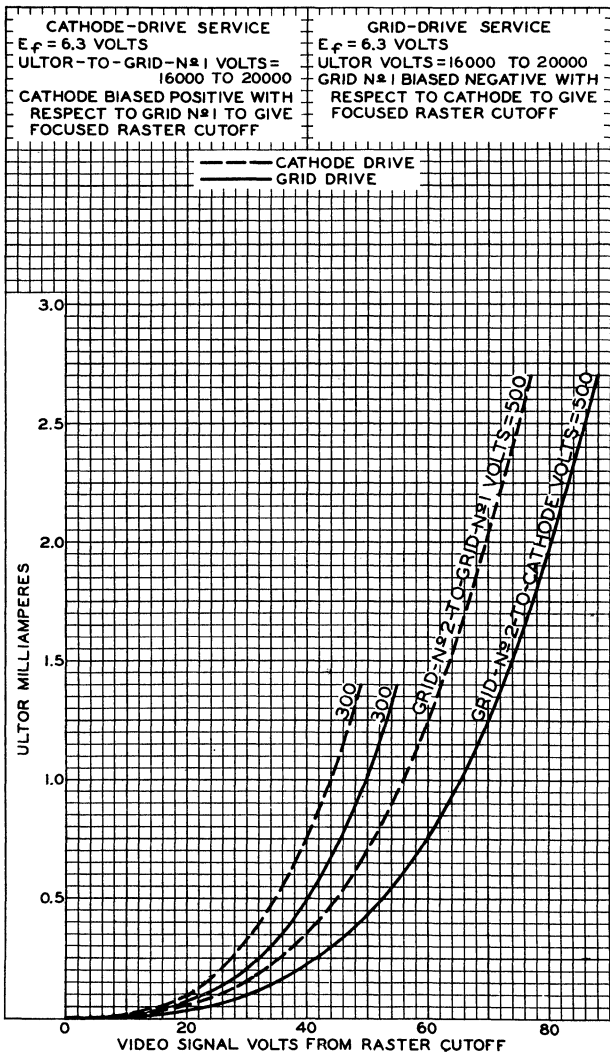
0



24CP4-A

AVERAGE DRIVE CHARACTERISTICS

24CP4-A



24CP4A

Picture Tube

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
90° 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	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor.	{ 2500 max. 2000 min.	{ μμf μμf
Electron Gun.	Ion-Trap Type Requiring External Single-Field Magnet	

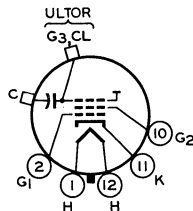
Optical:

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 and Dimensions:	
See <i>Picture-Tube Dimensional-Outlines</i> and <i>Bulb J192 A/B</i> 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—Ultor
(Grid No.3,
Collector)
- C—External
Conductive
Coating

Maximum Ratings, Design-Maximum Values:

ULTOR VOLTAGE	22000 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts



24CP4A

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:

<i>With ultor voltage of</i>	<i>16000</i>	<i>volts</i>
<i>and grid-No.2 voltage of</i>	<i>300</i>	<i>volts</i>

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





27MP4

27MP4 PICTURE TUBE

RECTANGULAR METAL-SHELL 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

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"

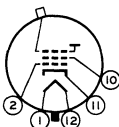
Operating Position Any

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.

27MP4



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*



27RP4

27RP4

PICTURE TUBE

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage (AC or DC)	6.3	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 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.

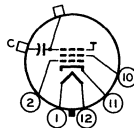
Operating Position Any

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 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

27RP4



27RP4

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*

27VP4

Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
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	$\mu\mu\text{f}$
Cathode to all other electrodes	5	$\mu\mu\text{f}$
External conductive coating to ultor.	{2500 max. 2000 min.	$\mu\mu\text{f}$
		$\mu\mu\text{f}$
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:

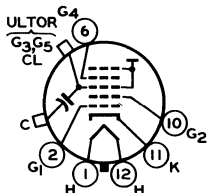
Operating Position.	Any
Weight (Approx.).	44 lbs
Overall Length.	21-1/16" \pm 3/8"
Neck Length	5-1/2" \pm 3/16"
Projected Area of Screen.	425 sq. in.

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



27VP4

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





902-A

902-A

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	μf
DJ ₁ to All Other Electrodes	8.5	μf
DJ ₄ to All Other Electrodes	6.0	μf

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"

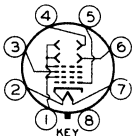
Greatest Diameter of Bulb 2" ± 1/16"

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,		Pin 3- Anode No.1
Anode No.2,		Pin 4- Deflecting
Deflecting		Electr. DJ ₁
Electrode DJ ₂		Pin 5- Grid No.1
Deflecting		Pin 6- Deflecting
Electrode DJ ₃	Electr. DJ ₄	Pin 7- Heater
Pin 2-Heater,		Pin 8- No Connection
Cathode		

*DJ₁ and DJ₂ are nearer the screen
 DJ₃ and DJ₄ are nearer the base*

With DJ₁ positive with respect to DJ₂, the spot is deflected toward pin 3. With DJ₃ positive with respect to DJ₄, the spot is deflected toward pin 1.

The angle between the trace produced by DJ₃ and DJ₄ and its intersection with the plane through the tube axis and pin 1 does not exceed 10°.

The angle between the trace produced by DJ₃ and DJ₄ and the trace produced by DJ₁ and DJ₂ 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



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 Volt- age 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 DJ₁ and DJ₂. Suitable test conditions are: anode-No.2 voltage, 600 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 megohm each for DJ₁ and DJ₄, connected to anode No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.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.



6499

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	$\mu\mu\text{f}$
Deflecting electrode DJ ₁ to all other electrodes	13	$\mu\mu\text{f}$
Deflecting electrode DJ ₂ to all other electrodes	13	$\mu\mu\text{f}$
Deflecting electrode DJ ₃ to all other electrodes	11.5	$\mu\mu\text{f}$
Deflecting electrode DJ ₄ to all other electrodes	11.5	$\mu\mu\text{f}$
DJ ₁ to DJ ₂	3	$\mu\mu\text{f}$
DJ ₃ to DJ ₄	3	$\mu\mu\text{f}$
Grid No.5 to backing-electrode	800	$\mu\mu\text{f}$
Grid No.5 and backing-electrode to collector	4	$\mu\mu\text{f}$
Collector to all other electrodes & external cylindrical shield		See Curve

Focusing Method Electrostatic

Deflection Method Electrostatic

Overall Length 11-27/32" \pm 3/8"

Greatest Diameter of Tube 3.30" \pm 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)

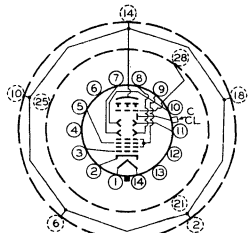
VIEW OF TWENTYNINAR-BASE END OF TUBE

Pin 2 } Multiple Connections to Backing-Electrode. Only One Need be Used
Pin 6 }
Pin 10 }
Pin 14 }
Pin 18 }

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

6499



6499

RADECHON

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 10-Deflecting Electrode DJ ₂
Pin 2-Cathode	Pin 11-Deflecting Electrode DJ ₁
Pin 3-Grid No.1	Pin 12-No Connection
Pin 4-Internal Con- nection-Do Not Use	Pin 13-Same as Pin 4
Pin 5-Grid No.3	Pin 14-Heater
Pin 6-No Connection	C, CL-External Con- ductive Coating, Collector, In- ternal Shield, Flange between Neck and Large Part of Tube
Pin 7-Deflecting Electrode DJ ₄	
Pin 8-Deflecting Electrode DJ ₃	
Pin 9-Ultor (Grids No.2 & No.4)	

*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_{c4}) 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.



6499

6499

RADECHON

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_{C4}	volts
Grid-No.1 Voltage for collector-current cutoff	-2.5% to -4.7% of E_{C4}	volts
Collector Current for grid-No.1 volts = 0.	20 to 50	μ amp
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_{C4}	
DJ ₃ and DJ ₄	78 to 96 v dc/in./kv of E_{C4}	
Spot Position.	See Note 2	
Signal-Uniformity Ratio.	See Note 3	

Examples of Use Design Ranges:

<i>For ultor voltage of</i>	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.



RADECHON

required to displace the beam from its undeflected position to the edge of the storage surface in the direction of each deflecting electrode are recorded as a for DJ_1 , b for DJ_2 , c for DJ_3 , and d for DJ_4 .

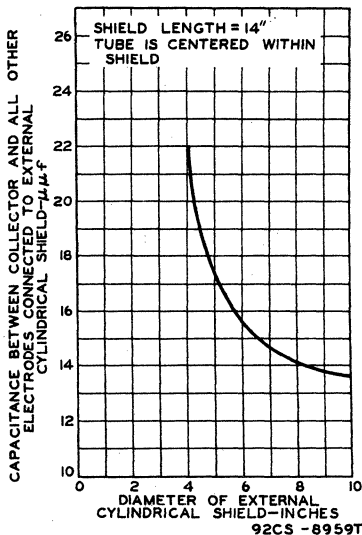
Spot Position in % of Storage-Surface Diameter

$$= 1/2 \sqrt{\left(\frac{b-a}{b+a}\right)^2 + \left(\frac{d-c}{d+c}\right)^2} \times 100$$

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.

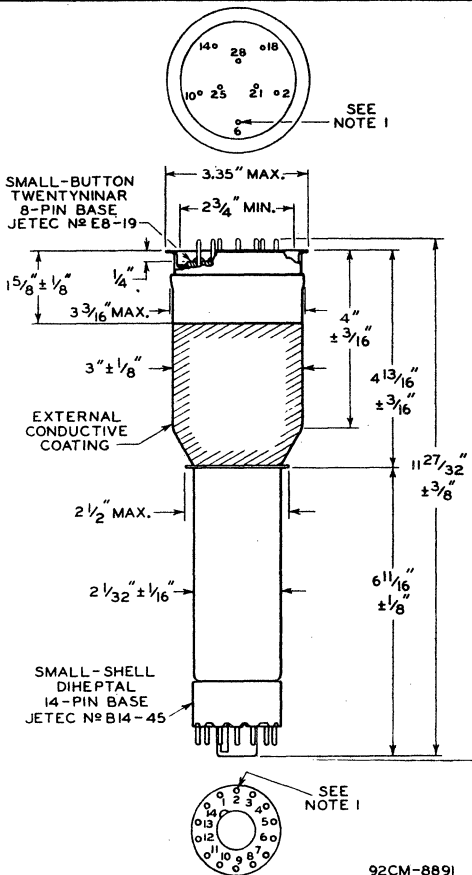
INDICATED CAPACITANCE
VS. SHIELD DIAMETER



6499

RADECHON

6499



92CM-8891

NOTE 1: THE ANGLE BETWEEN PLANE THROUGH PIN 6 OF TWENTYNINAR 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 DJ₁ & DJ₂ ARE NEARER THE TARGET. DEFLECTING ELECTRODES DJ₃ & DJ₄ ARE NEARER THE DIHEPTAL BASE.

NOTE 3: ANGLE BETWEEN DJ₁ & DJ₂ DEFLECTION PATH AND DJ₃ & DJ₄ DEFLECTION PATH IS 90° ± 30°.

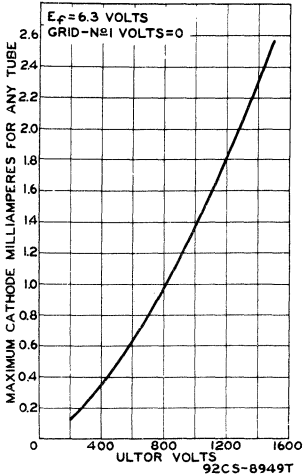
6499



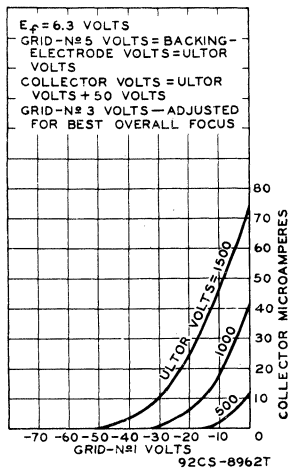
6499

RADECHON

MAXIMUM CATHODE CURRENT



AVERAGE TRANSFER CHARACTERISTICS

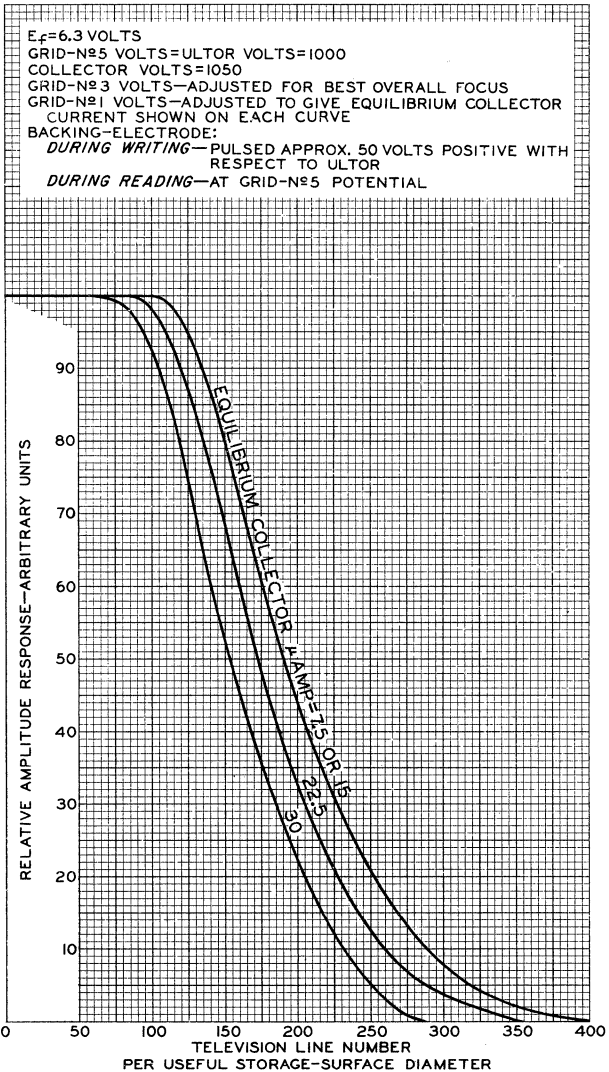




6499

6499

RESOLUTION CHARACTERISTICS

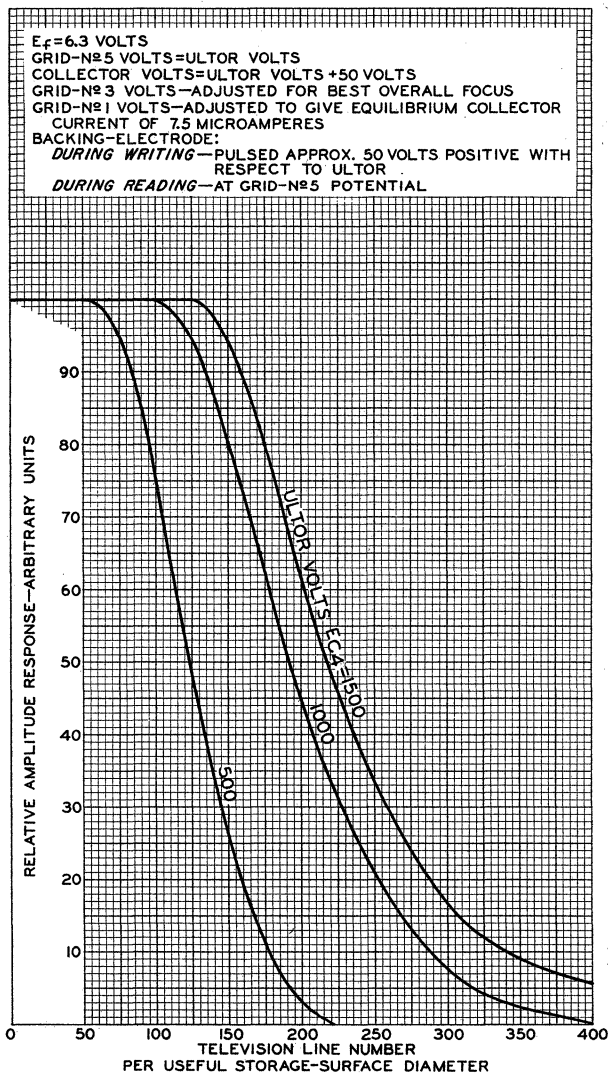


6499



6499

RESOLUTION CHARACTERISTICS



TUBE DIVISION

92CM-8954

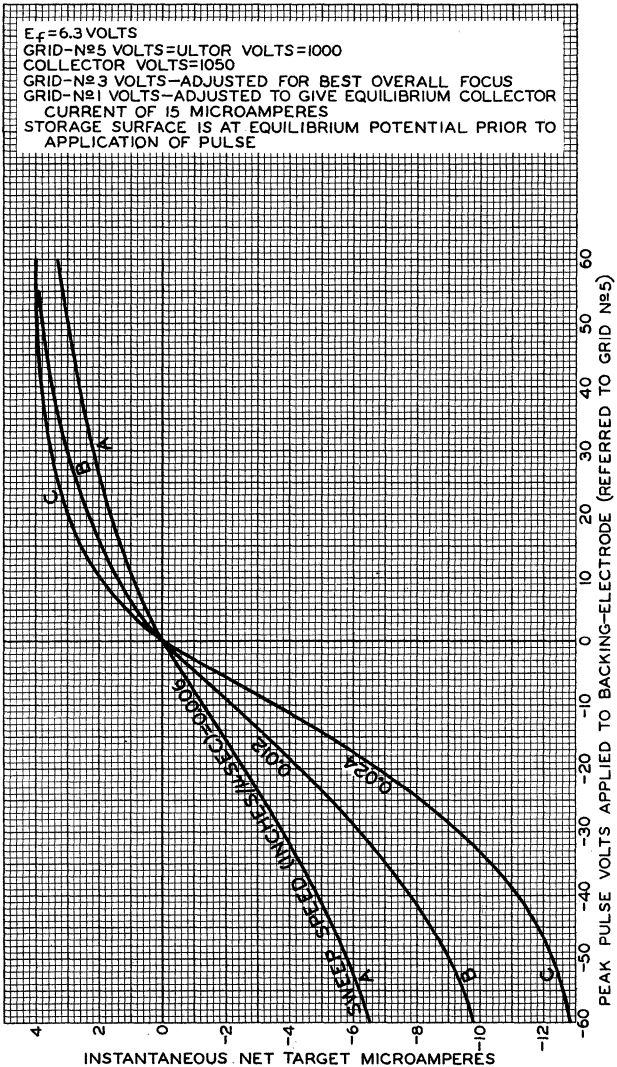
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



6499

6499

TYPICAL TARGET CHARACTERISTICS



INSTANTANEOUS NET TARGET MICROAMPERES

TUBE DIVISION

92CL-8961

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

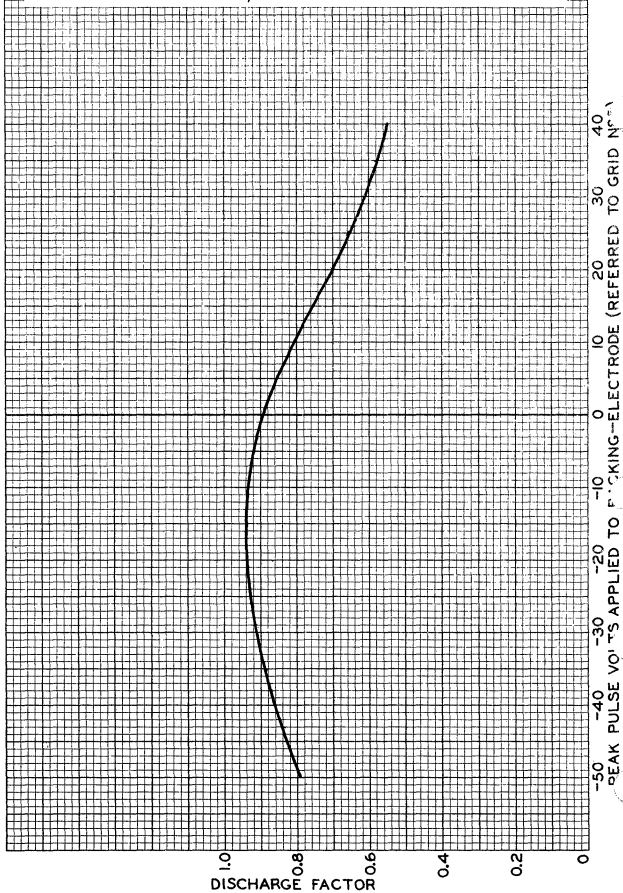
6499



6499

APPROXIMATE DISCHARGE-FACTOR CHARACTERISTIC

$E_f = 6.3$ VOLTS
 GRID-N \approx 5 VOLTS=ULTOR VOLTS=1000
 COLLECTOR VOLTS=1050
 GRID-N \approx 3 VOLTS—ADJUSTED FOR BEST OVERALL FOCUS
 GRID-N \approx 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/ μ SEC



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8960



6571

6571

COMPUTER STORAGE TUBE

SINGLE-BEAM, PRIMARY-CURRENT-MODULATION TYPE
REDISTRIBUTION 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.	6.5	μμf
Grid No.1 to deflecting electrode DJ ₁ . . .	0.2	μμf
Grid No.1 to deflecting electrode DJ ₂ . . .	0.2	μμf
Grid No.1 to deflecting electrode DJ ₃ . . .	0.2	μμf
Grid No.1 to deflecting electrode DJ ₄ . . .	0.2	μμf
Cathode to all other electrodes.	5	μμf
DJ ₁ to DJ ₂	2.8	μμf
DJ ₃ to DJ ₄	2.6	μμf
DJ ₁ to all other electrodes.	9	μμf
DJ ₂ to all other electrodes.	9	μμf
DJ ₃ to all other electrodes.	8	μμf
DJ ₄ to all other electrodes.	7	μμf

Focusing Method. Electrostatic

Deflection Method. Electrostatic

Deflecting-electrode arrangement. See Dimensional Outline

Storage Surface. On inner surface of faceplate

Signal-Output Electrode. Metal plate or 50-line (minimum) mesh covering external surface of faceplate and capacitively coupled to the storage surface. (This electrode is not supplied with the tube).

Overall Length 11-1/2" ± 1/4"

Greatest Diameter of Bulb. 3" ± 1/16"

Weight (Approx.) 9 oz

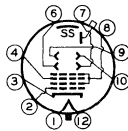
Mounting Position. Center of tube face must be at same elevation as or at higher elevation than tube base.

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

Base Small-Shell Duodecal 10-Pin (JETEC No. B10-75)

BOTTOM VIEW

- Pin 1 - Heater
- Pin 2 - Grid No.1
- Pin 3 - Cathode
- Pin 4 - Grid No.3
- Pin 6 - Deflecting Electrode DJ₄
- Pin 7 - Deflecting Electrode DJ₃
- Pin 8 - Ultor (Grids No.2 & No.4)



- Pin 9 - Deflecting Electrode DJ₂
- Pin 10 - Deflecting Electrode DJ₁
- Pin 12 - Heater
- Cap - Collector
- SS - Storage Surface▲

▲ The Signal-output Electrode is capacitively coupled to the Storage Surface.

MAY 1, 1955

TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6571



6571

COMPUTER STORAGE TUBE

Maximum Ratings, Design-Center Values:

COLLECTOR VOLTAGE:

Difference between collector voltage and ultor voltage. 150 max. volts

ULTOR* VOLTAGE 2500 max. volts

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_{c4}) between 1000 and 2500 volts

Collector Voltage. 95% to 105% of E_{c4} volts

Grid-No.3 Voltage. 20% to 28% of E_{c4} volts

Max. Grid-No.1 Voltage for Beam-Current Cutoff 2.4% of E_{c4} volts

Max. Grid-No.3 Current Range. -15 to +10 μ amp

Deflection Factors:

DJ₁ & DJ₂. 39 to 53 v dc/in./kv of E_{c4}

DJ₃ & DJ₄. 35.5 to 48.5 v dc/in./kv of E_{c4}

Focused-Beam Position. ##

Examples of Use of Design Ranges:

For ultor voltage of 1000 2500 volts

Collector Voltage. 950 to 1050 2375 to 2625 volts

Grid-No.3 Voltage. 200 to 280 500 to 700 volts

Max. Grid-No.1 Voltage for Beam-Current Cutoff -24 -60 volts

Deflection Factors:

DJ₁ & DJ₂. 39 to 53 97.5 to 133 volts dc/in.

DJ₃ & DJ₄. 35.5 to 48.5 89 to 122 volts dc/in.

* 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 6571, the ultor function is performed by grid No.4. Since grid No.4 and grid No.2 are connected together within the 6571, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

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

MAY 1, 1955

TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



6571

6571

COMPUTER STORAGE TUBE

Storage Characteristics for Ultron Voltage of 2500 Volts:

Storage-Surface Boundary (In terms of deflection voltage):

In the DJ₁-DJ₂ direction from position of undeflected focused beam . . . ±109 volts

In the DJ₃-DJ₄ direction from position of undeflected focused beam . . . ±100 volts

Blemish Factor*, for storage surface within indicated boundary 0.5 max.

Spill (Determined for Double-Dot Pattern):**

Under conditions involving 255 references to "spill" element and 1 reference to "test" element

Separation Between Storage Elements, in either the DJ₁-DJ₂ or DJ₃-DJ₄ direction in terms of deflection voltage:

At center of storage surface 8 max. volts

At midpoint on each side of storage-surface boundary 10 max. volts

Maximum Circuit Values:

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

Resistance in Any Deflecting-Electrode Circuit[■] 1.0 max. megohm

* Blemish factor is defined as the factor by which the normal positive signal is reduced by the blemish.

** Spill is indicative of the amount of binary information that can be stored by the tube. The storage capability is determined by the separation between two storage elements at which the signal from one element is changed by no more than a specified amount after repeated references to the other element. For the 6571, the separation is measured, in terms of deflection voltage, when the amplitude of the negative signal of the "test" element has decreased to 50% of its maximum negative amplitude. The maximum negative amplitude is determined by separating the two elements far enough to eliminate the effects of secondary electron redistribution from the "spill" element.

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

OPERATING CONSIDERATIONS

Shielding. In typical computer applications, the 6571 is mounted in a compartment having effective magnetic and electrostatic shielding. It is recommended that the bulb be provided with a tight-fitting electrostatic shield extending from the base to the collector coating. (See *Dimensional Outline*). This external shield supplements the shielding action of the collector in preventing cross-coupling between the electron gun and the external signal electrode.

A *signal-output electrode* shaped to conform with the external contour of the faceplate and placed in contact with the entire area of the faceplate is required. The signal-output electrode is connected to a low-noise video

6571



6571

COMPUTER STORAGE TUBE

amplifier having sufficient gain to amplify signals from a fraction of a millivolt to the desired level.

The *amount of information that can be stored by the 6571* is dependent on the manner in which it is operated, and is affected by the stability of the deflecting system, freedom from noise in the associated output circuit, the number of regenerations compared with the number of addresses, and the effectiveness of the electrostatic and magnetic shielding.

In general, the number of storage elements is proportional to the operating ultor voltage. For the greatest number of storage elements, the 6571 should be operated at the rated maximum ultor voltage and so that the peak grid-No. 1 drive is less than that required for the maximum positive amplitude but high enough to provide a satisfactory output signal.

It is recommended that the beam current be limited to the minimum value which provides satisfactory signal amplitude.

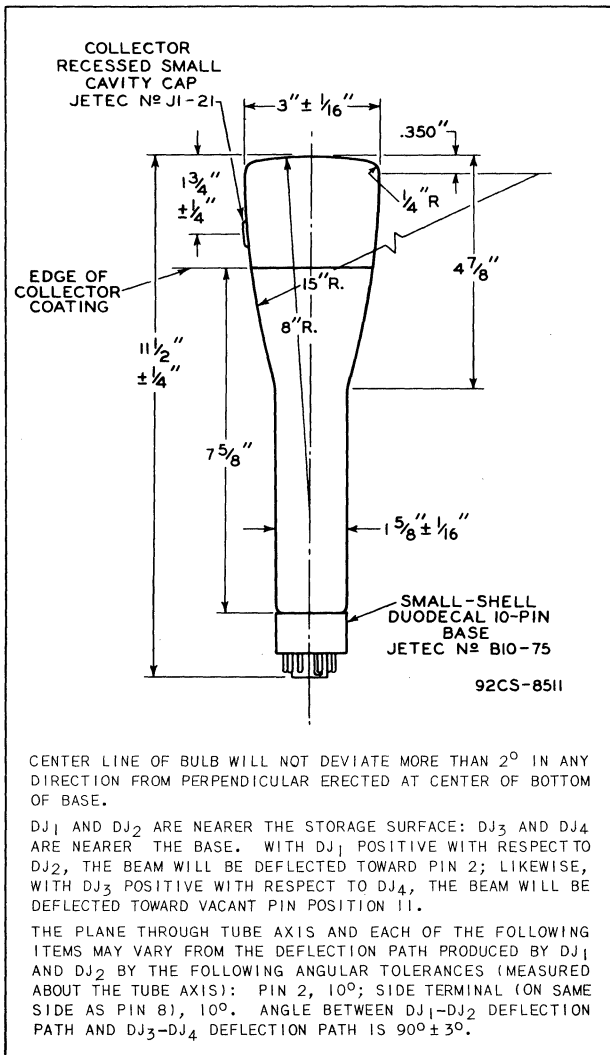
The *storage characteristics* in the tabulated data and curve are based on the use of a double-dot pattern. In this method of storage, the positive signal is produced by adjusting the beam current and the distance between two dot storage elements so that the optimum positive signal is produced when the "test" element is addressed. Other methods of storage such as superimposed focused and defocused spots or dots and dashes may be used equally well with the 6571.



6571

6571

COMPUTER STORAGE TUBE



MAY 1, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

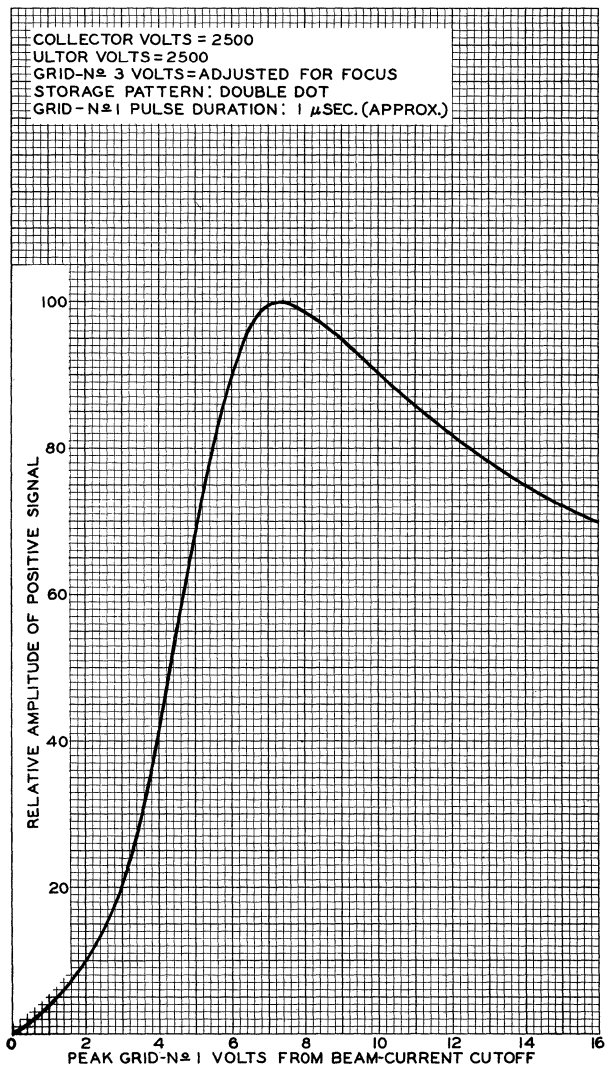
CE-8511

6571



6571

AVERAGE CHARACTERISTIC



JAN. 27, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8510



6472

6472

MULTIPLIER PHOTOTUBE

9-STAGE TYPE WITH S-4 RESPONSE
For Headlight-Control Service

DATA

General:

Spectral Response	S-4
Wavelength of Maximum Response.	4000 ± 500 angstroms
Cathode:	
Minimum projected length*	15/16"
Minimum projected width*	5-16"
Direct Interelectrode Capacitances:	
Anode to dynode No.9	4.2 μμf
Anode to all other electrodes	5.5 μμf
Maximum Overall Length (Excluding leads).	2-3/4"
Maximum Envelope Length (Excluding tip)	2-1/4"
Length from Envelope Seal to	
Center of Useful Cathode Area	1-1/4" ± 3/32"
Maximum Diameter.	1-3/16"
Bulb	T-9
Mounting Position	Any
Weight (Approx.).	2 oz
Terminals, Flexible Lead.	See Dimensional Outline

BOTTOM VIEW

- Lead 1 - Cathode
- Lead 2 - Dynode No.1
- Lead 3 - Dynode No.2
- Lead 4 - Dynode No.3
- Lead 5 - Dynode No.4
- Lead 6 - Dynode No.5



- Lead 7 - Dynode No.6
- Lead 8 - Dynode No.7
- Lead 9 - Dynode No.8
- Lead 10 - Dynode No.9
- Lead 11 - Anode

DIRECTION OF LIGHT

Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	1250 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.9 AND ANODE (DC or Peak AC)	250 max.	volts
AVERAGE ANODE CURRENT ^o	0.1 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

* On plane perpendicular to the indicated direction of light (See Dimensional Outline).

^o Averaged over any interval of 30 seconds maximum.



MULTIPLIER PHOTOTUBE

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Under conditions with supply voltage (E) across voltage divider providing $1/10$ of E between cathode and dynode No. 1; $1/10$ of E for each succeeding dynode stage; and $1/10$ of E between dynode No. 9 and anode

With $E = 1000$ volts

	Min.	Median	Max.	
Sensitivity:				
Radiant, at 4000 angstroms	-	32500	-	$\mu\text{amp}/\mu\text{watt}$
Luminous: [▲]				
At 0 cps	5	35	250	amp/lumen
At 100 Mc.	-	33	-	amp/lumen
Electrode Dark Current (At 25°C):				
Anode.	-	-	0.25 [♠]	μamp
Any other electrode.	-	-	0.75	μamp

[▲] For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

[♠] With sine-wave, 60-cycle supply voltage adjusted to give sensitivity of 7.5 amperes per lumen.

OPERATING CONSIDERATIONS

The *operating stability* of the 6472 is dependent on the magnitude of the anode current and its duration. When the 6472 is operated at high values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 6472 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 0.1 milliamperes is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 10 microamperes.

A recommended design of voltage-divider network for use with the 6472 to provide stable operation and long tube life is shown in the accompanying circuit. This design provides linear operation within the range normally required for dimming. At higher light levels, the network design limits the tube output to a safe value. The indicated design values provide dimming operation for an anode current in the range between 5 and 10 microamperes on basis of dc operation. When operation at other current values is desired, the values of the resistors can be changed proportionately.

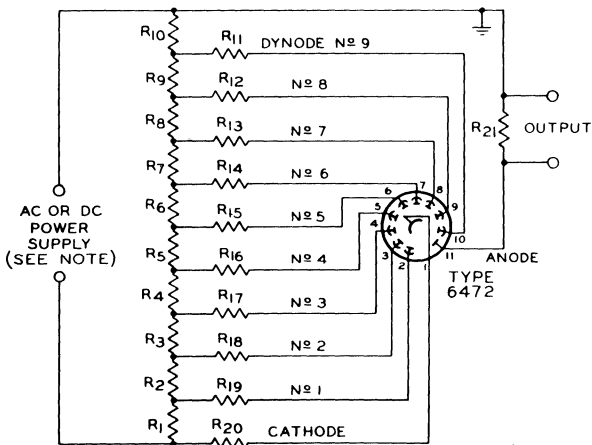


6472

6472

MULTIPLIER PHOTOTUBE

RECOMMENDED VOLTAGE-DIVIDER NETWORK FOR USE WITH TYPE 6472 IN HEADLIGHT-DIMMING SERVICE



92CS-8526

R1 R2 R3 R4 R5

R6 R7 R8 R9 R10: 1 megohm, 1/2 watt

R11: 2 megohms, 1/2 watt

R12: 5.1 megohms, 1/2 watt

R13 R14 R15 R16

R17 R18 R19 R20: 8.2 megohms, 1/2 watt

R21: 820,000 ohms, 1/2 watt

NOTE: Adjustable between approximately 500 and 1000 volts dc or peak ac.

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

MAY 1, 1955

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

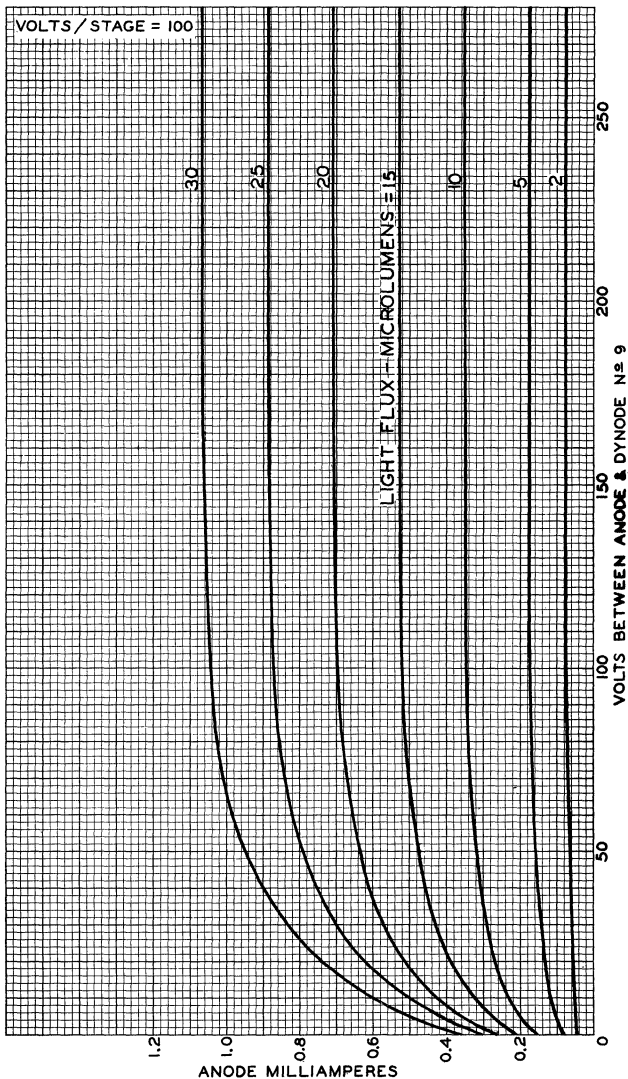
CE-8526



6472

6472

AVERAGE ANODE CHARACTERISTICS



JAN. 29, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM - 8029RI

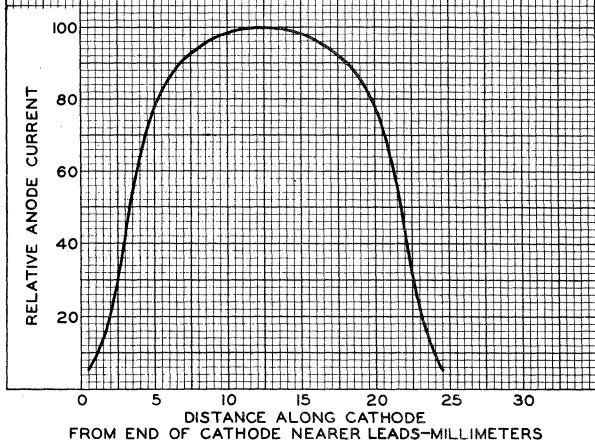
6472



6472

VARIATION IN SENSITIVITY OF
PHOTOCATHODE ALONG ITS LENGTH

SPOT SIZE: 1MM APPROX.
VARIATIONS CAUSED BY INTERCEPTION
OF LIGHT BY GRILL AS WELL AS
SURFACE IRREGULARITIES HAVE BEEN
IGNORED



FEB. 11, 1955

FROM END OF CATHODE NEARER LEADS—MILLIMETERS

TUBE DIVISION

92CM-8535

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

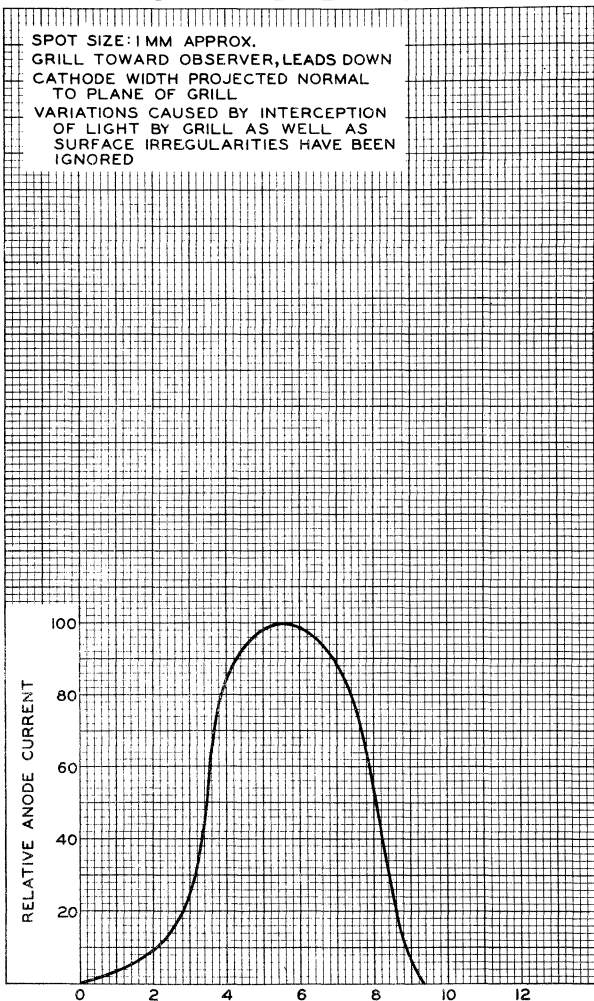


6472

6472

VARIATION IN SENSITIVITY OF PHOTOCATHODE ACROSS ITS PROJECTED WIDTH IN PLANE OF GRILL

SPOT SIZE: 1 MM APPROX.
GRILL TOWARD OBSERVER, LEADS DOWN
CATHODE WIDTH PROJECTED NORMAL
TO PLANE OF GRILL
VARIATIONS CAUSED BY INTERCEPTION
OF LIGHT BY GRILL AS WELL AS
SURFACE IRREGULARITIES HAVE BEEN
IGNORED



FEB. 11, 1955

TUBE DIVISION

92CM-8536

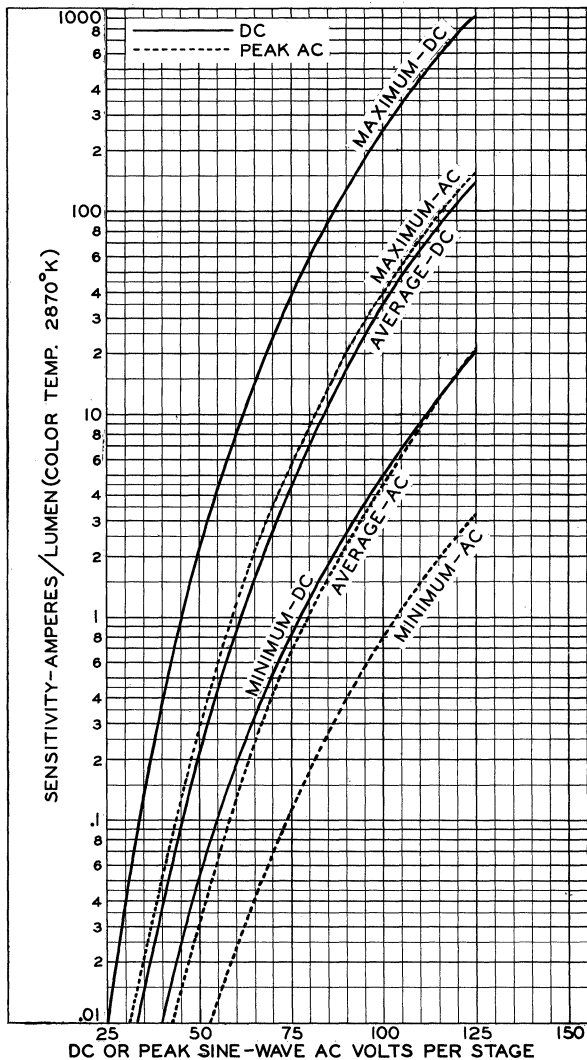
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6472



6472

RANGE OF LUMINOUS SENSITIVITY



JAN. 29, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-8027RI



6866

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.):^o			
Grid No. 1 to all other tube electrodes			
	6	18	μuf
Cathode to all other tube electrodes			
	4.2	6.5	μuf
Deflecting electrode DJ₁ to deflecting electrode DJ₂			
	1.8	-	μuf
Deflecting electrode DJ₃ to deflecting electrode DJ₄			
	1.8	-	μuf
DJ₁ to all other tube electrodes.			
	7.5	-	μuf
DJ₂ to all other tube electrodes.			
	8	-	μuf
DJ₃ to all other tube electrodes.			
	6	-	μuf
DJ₄ to all other tube electrodes.			
	7.	-	μuf
Focusing Method	Electrostatic	None	
Deflection Method	Electrostatic	None	
Deflecting-Electrode Arrangement.	<i>See Dimensional Outline</i>		-
Phosphor.	-	High-Visual-Efficiency Type, Aluminized	
Fluorescence	-	Yellow	
Phosphorescence.	-	Yellow	
Minimum Useful Screen Diameter.			4"
Maximum Overall Length.			15-1/2"
Seated Length			14" \pm 3/8"
Maximum Tube Radius			3-5/32"
Bulb-Flange Diameter.			5-1/8" \pm 1/16"
Greatest Bulb Diameter.			5" \pm 1/16"
Bulb Terminals:			
Caps (Two).	Recessed Small Cavity (JETEC No. J1-21)		
Flange.	<i>See Dimensional Outline</i>		
Flexible cable.	<i>See Dimensional Outline</i>		
Ambient-Temperature Range	-65° to +100 °C		
Mounting Position	Any		
Weight (Approx.).	2 lbs		
Socket.	Alden Part No. 435SBA, or equivalent		
Base.	Small-Button Thirtyfivar 31-Pin (JETEC No. E31-36)		

^o Without external shield.

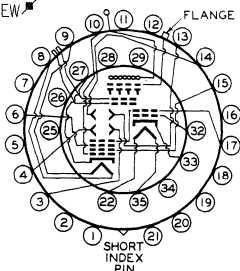
6866



6866

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.



6866

6866

DISPLAY STORAGE TUBE

	Writing Section	Viewing Section**		
<i>Equivalent Values</i>				
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.



6866

6866

DISPLAY STORAGE TUBE

- ▲ Expressed in terms of the time required for the brightness of the un-written 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.

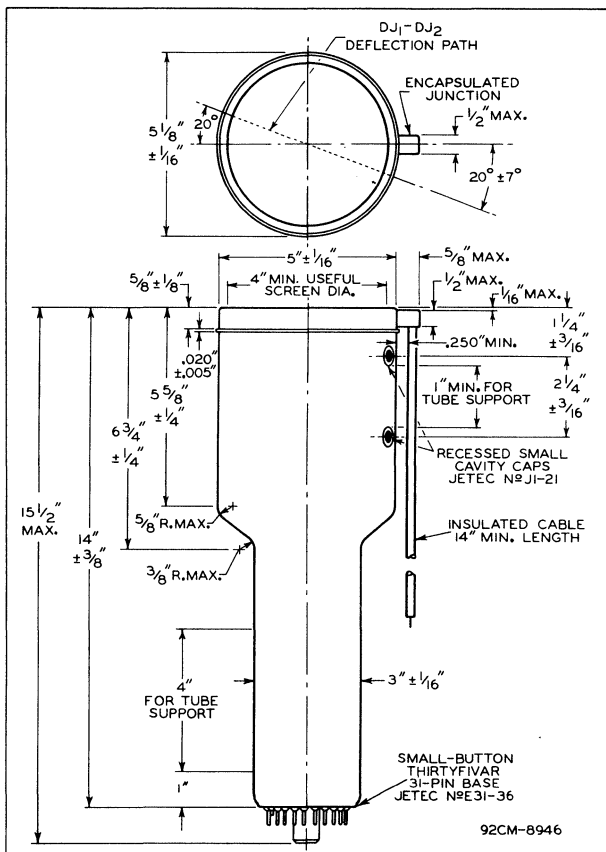
← Indicates a change.

6866



6866

DISPLAY STORAGE TUBE



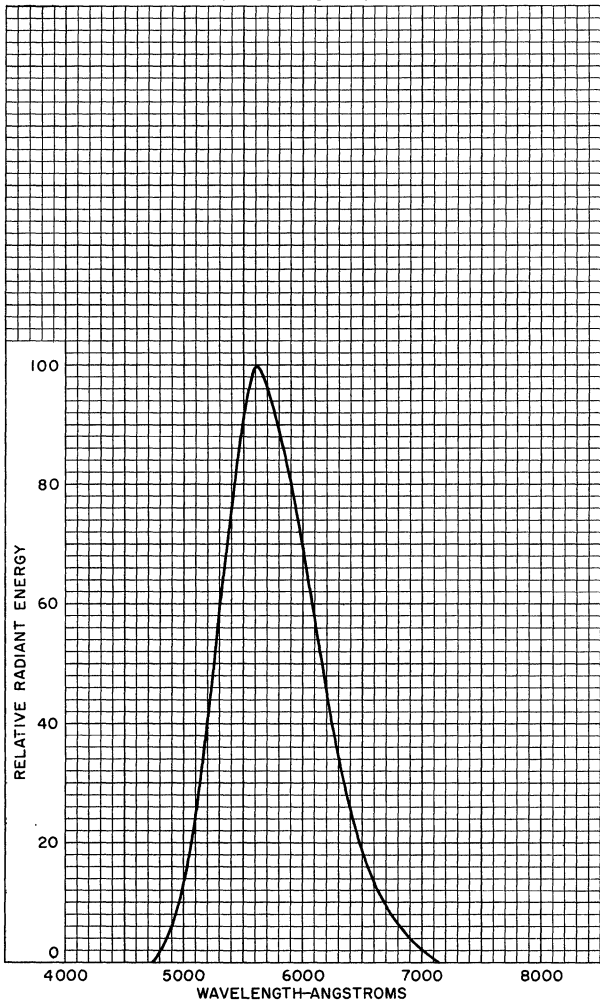
CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 3° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF FACEPLATE. THE PLANE THROUGH TUBE AXIS AND EACH OF THE FOLLOWING ITEMS MAY VARY FROM THE DEFLECTION PATH PRODUCED BY DJ₁ AND DJ₂, BY THE FOLLOWING ANGULAR TOLERANCES (MEASURED ABOUT THE TUBE AXIS): PIN 27, ± 10°; EACH CAVITY CAP (ON SAME SIDE AS PIN 27), ± 17°; ENCAPSULATED JUNCTION, + 10°. ANGLE BETWEEN DJ₁ - DJ₂ DEFLECTION PATH AND DJ₃ - DJ₄ DEFLECTION PATH IS 90° ± 3°.



6866

6866

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR



6866



6866

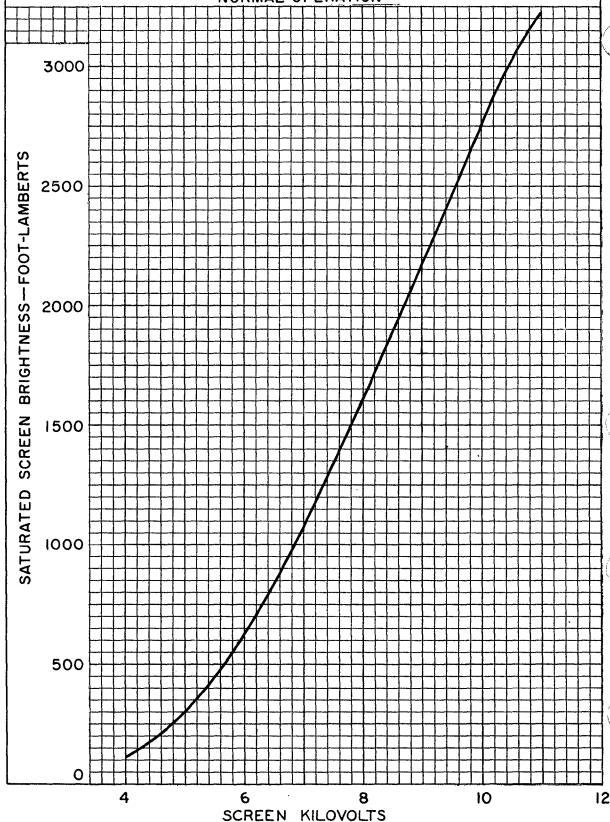
AVERAGE CHARACTERISTIC

VIEWING SECTION $E_f = 6.3$ VOLTS

BACKING-ELECTRODE VOLTS* = 5

GRID-N₂ 4 VOLTS* = 210GRID-N₂ 2 VOLTS* = 85GRID-N₂ 3 VOLTS* } ADJUSTED FOR BRIGHTEST,GRID-N₂ 1 VOLTS* } MOST UNIFORM DISPLAY.

*REFERRED TO CATHODE OF VIEWING GUN.

WRITING SECTIONNORMAL OPERATION



6866

6866

AVERAGE CHARACTERISTICS

VIEWING SECTION

$E_f = 6.3$ VOLTS

SCREEN KILOVOLTS* = 5 TO 10

BACKING-ELECTRODE VOLTS* = 5

GRID-N₂ VOLTS* = 85

GRID-N₃ VOLTS* } ADJUSTED FOR BRIGHTEST,

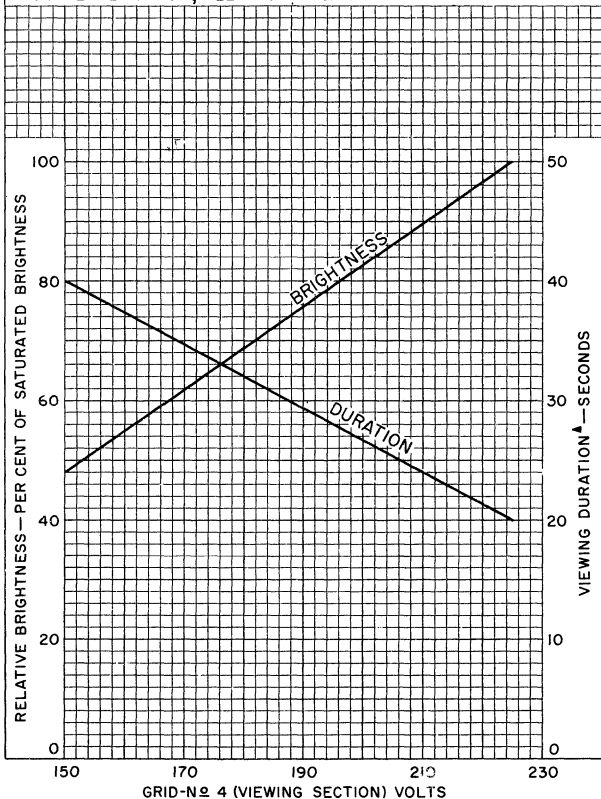
GRID-N₁ VOLTS* } MOST UNIFORM DISPLAY

* REFERRED TO CATHODE OF VIEWING GUN

WRITING SECTION

NORMAL OPERATION

▲ FOR EXPLANATION, SEE TABULATED DATA



GRID-N₄ (VIEWING SECTION) VOLTS

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9044

6866



6866

TYPICAL ERASURE CHARACTERISTICS

VIEWING SECTION

 $E_f = 6.3$ VOLTSGRID-N \circ 4 VOLTS* = 210

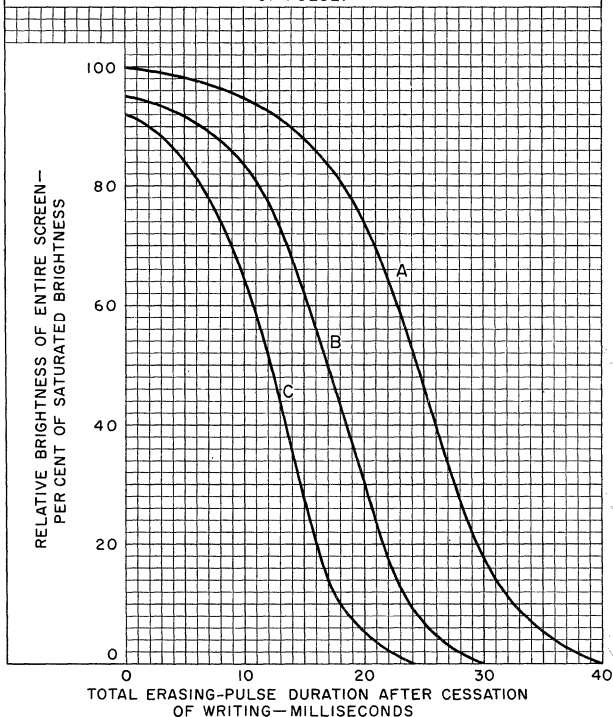
SCREEN KILOVOLTS* = 10

GRID-N \circ 2 VOLTS* = 85
 GRID-N \circ 3 VOLTS* } ADJUSTED FOR BRIGHTEST,
 GRID-N \circ 1 VOLTS* } MOST UNIFORM DISPLAY

*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

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9045



6866

6866

CURRENT CHARACTERISTIC FOR WRITING GUN

WRITING SECTION

$E_f = 6.3$ VOLTS

GRID-NO 4 VOLTS* = GRID-NO. 2 VOLTS

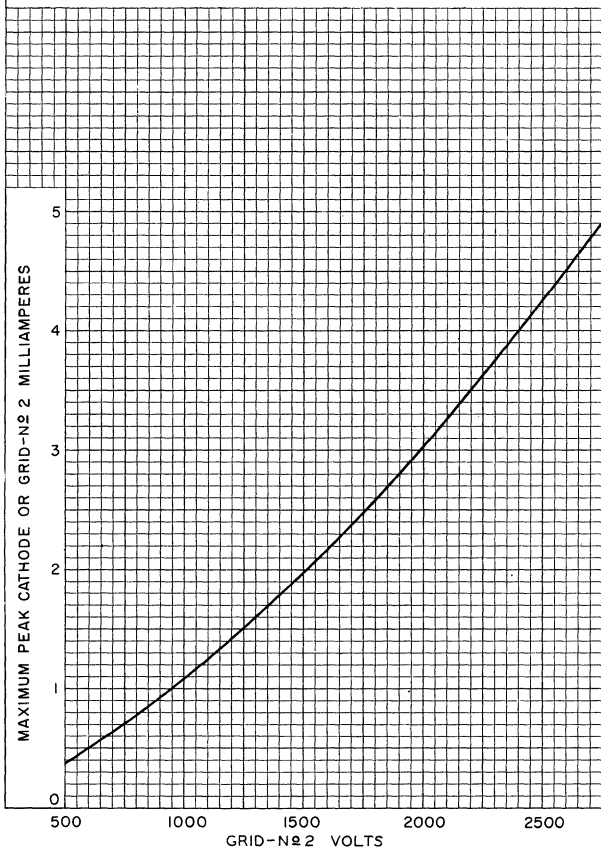
GRID-NO 3 VOLTS* = ADJUSTED FOR FOCUS

GRID-NO 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-№ 4 VOLTS* = 2500

GRID-№ 3 VOLTS* = ADJUSTED FOR FOCUS

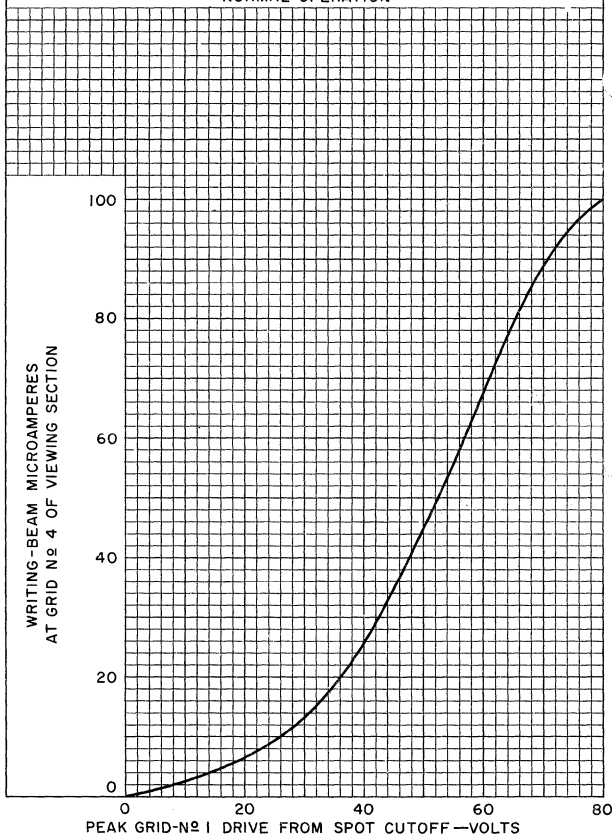
GRID-№ 2 VOLTS* = 2500

GRID-№ 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



6896/1855

OPERATION CHARACTERISTICS

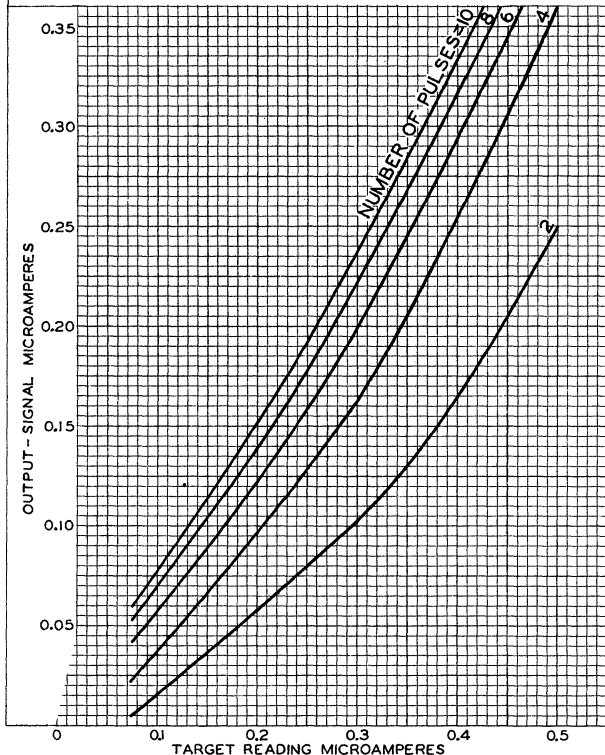
6896

 $E_f = 6.3$ VOLTS—EACH GUN

BACKING-ELECTRODE-TO-GRID-№4 VOLTS = -10

SHADING-ELECTRODE-TO-GRID-№4 VOLTS = +20

	Writing Gun	Reading Gun
GRID-№4 VOLTS TO GROUND	0	0
GRID-№3 VOLTS	ADJUSTED FOR FOCUS	ADJUSTED FOR FOCUS
GRID-№2 VOLTS TO GROUND	-8750	0
GRID-№1 VOLTS	ADJUSTED TO CUTOFF	VARIED TO GIVE TARGET μ A AS SHOWN
CATHODE VOLTS TO GROUND	-9000	-1000
GRID-№1 PEAK PULSE VOLTS FROM BEAM-CURRENT CUTOFF	12.5	-
SCANNING:	PPI	TV
RATE (REV/SEC)	0	-
SWEEP PRF (PPS)	1000	-
SWEEP TIME (μ SEC/RADIUS)	100	-
INPUT SIGNAL, RECTANGULAR PULSE:		
DURATION (μ SEC)	1	-
REPETITION RATE (PPS)	1000	-
NUMBER OF PULSES	AS SHOWN	-



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL - 9415



6896/1855

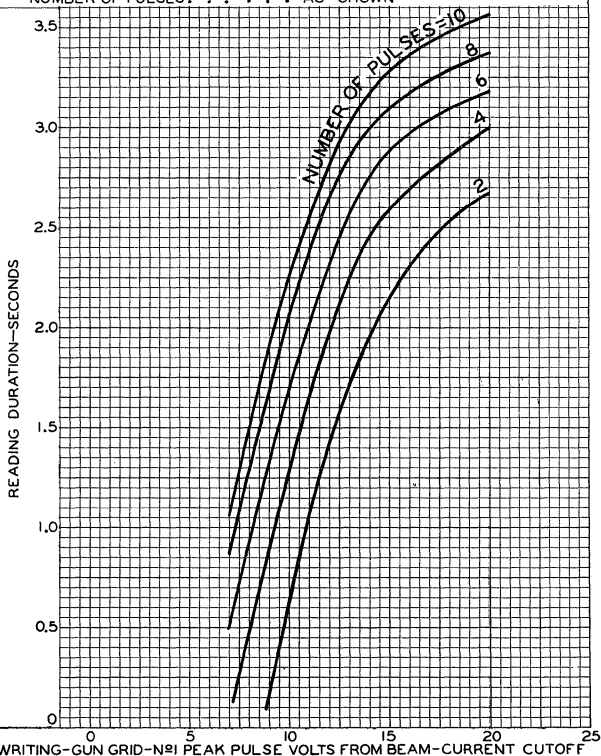
OPERATION CHARACTERISTICS

$E_f = 6.3$ VOLTS—EACH GUN

BACKING—ELECTRODE—TO—GRID—N^o4 VOLTS = -10

SHADING—ELECTRODE—TO—GRID—N^o4 VOLTS = +20

	Writing Gun	Reading Gun
GRID—N ^o 4 VOLTS TO GROUND	0	0
GRID—N ^o 3 VOLTS	ADJUSTED FOR FOCUS	ADJUSTED FOR FOCUS
GRID—N ^o 2 VOLTS TO GROUND	-8750	0
GRID—N ^o 1 VOLTS	ADJUSTED TO CUTOFF	ADJUSTED TO GIVE TARGET $\mu A = 0.5$
CATHODE VOLTS TO GROUND	-9000	-1000
TARGET MICROAMPERES	—	0.5
SCANNING:	PPI	TV
RATE (REV/SEC)	0	—
SWEEP PRF (PPS)	1000	—
SWEEP TIME (μ SEC/RADIUS)	100	—
INPUT SIGNAL, RECTANGULAR PULSE:		
DURATION (μ SEC)	1	—
REPETITION RATE (PPS)	1000	—
NUMBER OF PULSES	AS SHOWN	—





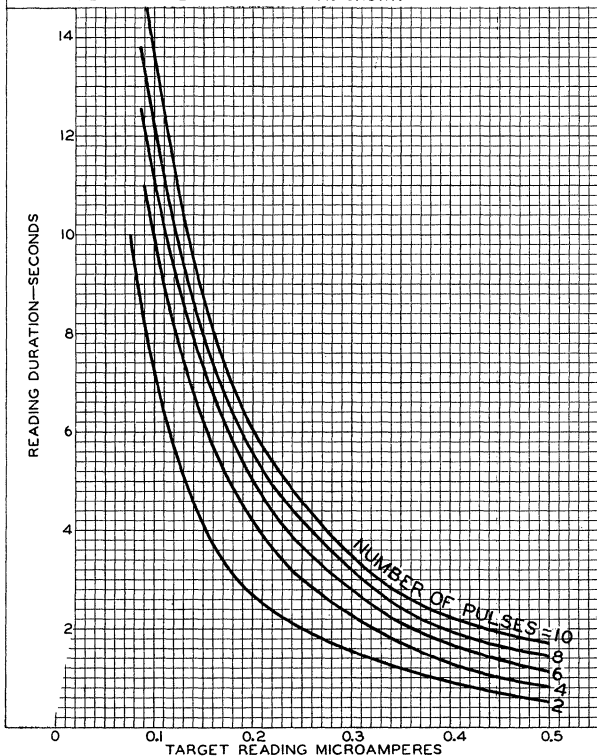
6896/1855

OPERATION CHARACTERISTICS

6896

 $E_f = 6.3$ VOLTS—EACH GUNBACKING - ELECTRODE - TO - GRID - N^o4 VOLTS = -10SHADING - ELECTRODE - TO - GRID - N^o4 VOLTS = +20

	Writing Gun	Reading Gun
GRID-N ^o 4 VOLTS TO GROUND	0	0
GRID-N ^o 3 VOLTS	ADJUSTED FOR FOCUS	ADJUSTED FOR FOCUS
GRID-N ^o 2 VOLTS TO GROUND	-8750	0
GRID-N ^o 1 VOLTS	ADJUSTED TO CUTOFF	VARIED TO GIVE TARGET μ A AS SHOWN
CATHODE VOLTS TO GROUND	-9000	-1000
GRID-N ^o 1 PEAK PULSE VOLTS FROM BEAM-CURRENT CUTOFF	12.5	—
SCANNING:	PPI	TV
RATE (REV/SEC)	0	—
SWEEP PRF (PPS)	1000	—
SWEEP TIME (μ SEC/RADIUS)	100	—
INPUT SIGNAL, RECTANGULAR PULSE:		
DURATION (μ SEC)	1	—
REPETITION RATE (PPS)	1000	—
NUMBER OF PULSES	AS SHOWN	—



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-9414





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	μf
Cathode to all other tube electrodes. . .	5	5	μf
Backplate to all other tube electrodes. . .	-	300	μf
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° C
Operating Position			Any
Weight (Approx.)			1-3/4 lbs
Terminal Connectors.			<i>See Operating Considerations</i>
Bulb Terminals:			
Caps (Three)			Recessed Small Cavity (JETEC No. J1-21)
Flexible leads (Two)			<i>See Dimensional Outline</i>
Base:			
Writing gun.			Small-Button Neoditetrar 8-Pin (JETEC No. EB-49)
Viewing gun.			Small-Button Miniature 7-Pin (JETEC No. E7-1)

^o, ♦: See next page.

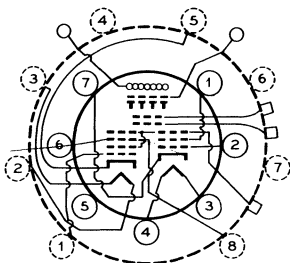
7183



7183

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 6- Internal Connection — Do Not Use
Pin 2-Heater	Pin 7-No Connec- tion
Pin 3-Heater	Pin 8-Grid No.3
Pin 4- Internal Connection — Do Not Use	
Pin 5-Cathode	

VIEWING SECTION

Small-Button Miniature 7-Pin Base

Pin 1-Grid No.2	Flexible Lead (Large)-Screen
Pin 2-Grid No.1	Flexible Lead (Small)-Backplate
Pin 3-Heater	Recessed Cavity Cap:
Pin 4-Heater	Located 1-1/4" from Tube Face-Grid No.5
Pin 5- Internal Connection — Do Not Use	Located 3" from Tube Face-Grid No.4
Pin 6-No Connec- tion	Located Near Viewing Gun-Grid No.3, Grids No.4 & No.2 of Writing Gun
Pin 7-Cathode	

Maximum Ratings, Absolute Values:

	Writing Section	Viewing Section	
SCREEN VOLTAGE .	-	10000 max.**	volts
PEAK BACKPLATE VOLTAGE. . . .	-	30 max.**	volts

○, ◆, ▲, **: See next page.



7183

7183

DISPLAY STORAGE TUBE

	Writing Section <i>Equivalent Values</i>		Viewing Section <i>Equivalent Values</i>	
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 VOLT- AGE:				
Heater nega- tive with respect to cathode.	125 max.*		125 max.**	volts
Heater posi- tive 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** 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

○, ◆, ▲, **, *, #, ●: See next page.



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 *CK-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.



7183

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.

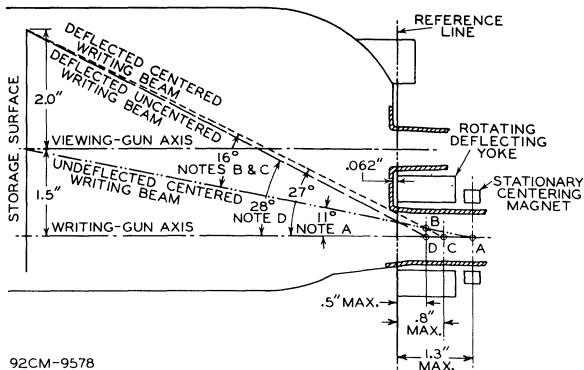
Terminal Connectors. The *base pins* of the Neoditetrar 8-pin base on the Writing-Gun neck fit the Ditetrar 8-contact connector, such as Cinch No. 54A18088, or equivalent. The *base pins* of the Small-Button Miniature 7-pin base on the Viewing-Gun neck fit the Miniature 7-contact socket. The *recessed 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.



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.

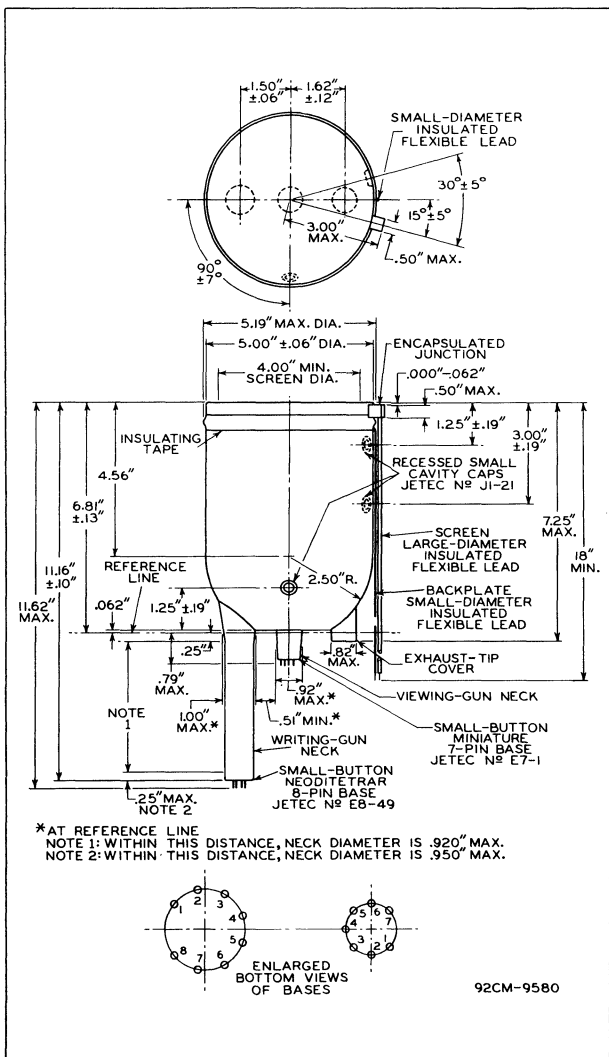
NOTE D: WHEN ROTATING YOKE IS USED WITH UNCENTERED DISPLAY, i.e., THE WRITING BEAM IS NOT CENTERED (NOTE A) BUT STRIKES THE STORAGE SURFACE ON THE WRITING-GUN AXIS, AND WITH THE EFFECTIVE CENTER OF DEFLECTION OF THE ROTATING YOKE LOCATED 0.5" FROM THE REFERENCE LINE, THE UNCENTERED WRITING BEAM MUST BE DEFLECTED THROUGH AN ANGLE OF 56° TO SWEEP FULLY THE STORAGE SURFACE.



7183

7183

DISPLAY STORAGE TUBE



7183



7183

TYPICAL CHARACTERISTIC

VIEWING SECTION

 $E_f = 6.3$ VOLTS

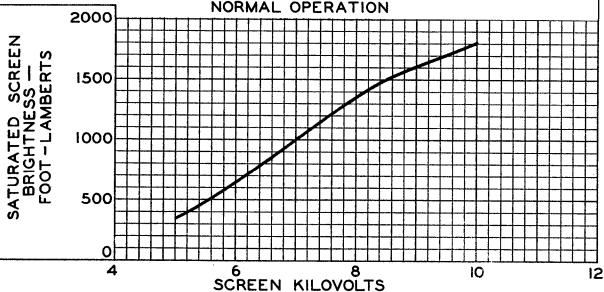
BACKPLATE VOLTS* = 0

GRID-N^o5 VOLTS* = 250GRID-N^o2 VOLTS* = 100GRID-N^o4 VOLTS*GRID-N^o3 VOLTS*GRID-N^o1 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

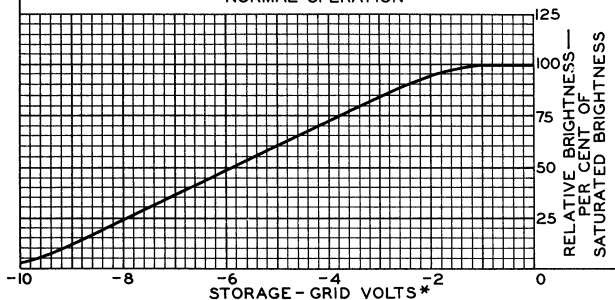
BACKPLATE VOLTS* = 0

GRID-N^o5 VOLTS* = 250GRID-N^o4 VOLTSGRID-N^o3 VOLTSGRID-N^o1 VOLTSGRID-N^o2 VOLTS* = 100} ADJUSTED
FOR BEST
COLLIMATION.

* REFERRED TO CATHODE OF VIEWING GUN.

WRITING SECTION

NORMAL OPERATION



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CS-9554



7183

7183

TYPICAL ERASURE CHARACTERISTICS

VIEWING SECTION

$E_f = 6.3$ VOLTS
 SCREEN VOLTS * = 8500
 BACKPLATE VOLTS * = 0
 GRID-N \circ 5 VOLTS * = 250

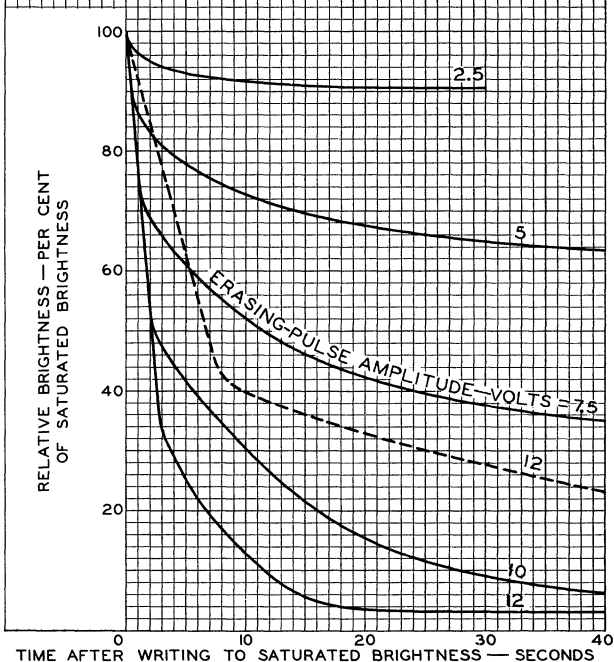
GRID-N \circ 4 VOLTS } ADJUSTED
 GRID-N \circ 3 VOLTS } FOR BEST
 GRID-N \circ 1 VOLTS } COLLIMATION.
 GRID-N \circ 2 VOLTS * = 100

* REFERRED TO CATHODE OF VIEWING GUN.

ERASING CONDITIONS

PULSE SHAPE: RECTANGULAR
 PULSE DURATION: 10μ SEC. APPROX.
 PULSE REPETITION FREQUENCY:

— CURVES: 2000 PPS
 - - - CURVE: 500 PPS



ELECTRON TUBE DIVISION

92CM-9555

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

(1)

(2)

(3)

(4)

(5)

(6)



7315

7315

DISPLAY STORAGE TUBE

DIRECT-VIEW TYPE
3.8"-DIAMETER DISPLAYWRITING GUN:
ELECTROSTATIC DEFLECTION
ELECTROSTATIC FOCUSVIEWING 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 volt-			
ages are applied.	-	30	sec
Direct Interelectrode Capac-			
itances (Approx.): ^o			
Grid No.1 to all other			
tube electrodes	6.5	11	$\mu\mu\text{f}$
Cathode to all other			
tube electrodes	5.5	8	$\mu\mu\text{f}$
Backplate to all other			
tube electrodes	-	116	$\mu\mu\text{f}$
Deflecting electrode DJ ₁ to			
deflecting electrode DJ ₂ . . .	1.9	-	$\mu\mu\text{f}$
Deflecting electrode DJ ₃ to			
deflecting electrode DJ ₄ . . .	2	-	$\mu\mu\text{f}$
DJ ₁ to all other tube electrodes.	6	-	$\mu\mu\text{f}$
DJ ₂ to all other tube electrodes.	7	-	$\mu\mu\text{f}$
DJ ₃ to all other tube electrodes.	5.5	-	$\mu\mu\text{f}$
DJ ₄ to all other tube electrodes.	4.8	-	$\mu\mu\text{f}$
Focusing Method	Electrostatic	None	
Deflection Method	Electrostatic	None	
Deflecting-Electrode Arrangement.	See Dimen-		-
	sional Outline		
Phosphor (For Curves, see front			
of this Section).	-	P20, Aluminized	
Fluorescence.	-	Yellow-Green	
Phosphorescence	-	Yellow-Green	
Minimum Useful Viewing Diameter ^v			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)		

7315

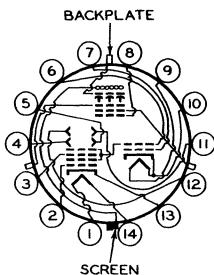


7315

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
	<i>Equivalent Values</i>		<i>Equivalent Values</i>	
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



7315

7315

DISPLAY STORAGE TUBE

	Writing Section		Viewing Section		
GRID-No.2 VOLT-AGE	2950 max.* [▲]	200 max.**	2950 max.* [▲]	200 max.**	volts
CATHODE VOLT-AGE	-	-2750 max.**	-	-	volts
GRID-No.1 VOLT-AGE:					
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



DISPLAY STORAGE TUBE

Maximum Grid-No.2 Current.	3	2.5	ma
Maximum Cathode Current.	8	6.5	ma
Number of Half-Tone Steps \square	5	5	
Viewing Duration \blacktriangle	20	40	sec
Maximum Erasing-Uniformity Factor $\square\square$	0.45	0.4	
Resolution $\#$	50	50	lines/in.
Brightness \blacklozenge	2750	1500	fl

WRITING SECTION*

Range Values for Equipment Design:*

For any grids-No.2 & No.4 voltage (E_{C2+4}) between
1500 and 2750 volts \blacktriangle

Grid-No.3 Voltage for focus.	17.5% to 37.5% of E_{C2+4}		volts
Maximum Grid-No.1 Voltage for cutoff of undeflected focused spot	-4.6% of E_{C2+4}		volts
Maximum Grid-No.3 Current.	-15 to +10		μ a
Maximum Cathode Current.	See Curve		
Deflection Factors:			
DJ ₁ & DJ ₂	36 to 48	v dc/in./kv of E_{C2+4}	
DJ ₃ & DJ ₄	35 to 47	v dc/in./kv of E_{C2+4}	
Focused Beam Position.	$\#\#$		
Writing Speed $\dagger\dagger$	3000		in./sec

Examples of Use of Design Ranges:*

For grids-No.2 & No.4 voltage (E_{C2+4}) \blacktriangle	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 \blacktriangle	+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 \blacksquare		0.1 max.	megohm
Series Current-Limiting Resistor (Unbypassed) in Grid-No.5 (Viewing-Section) Circuit		0.01 min.	megohm



7315

7315

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.

7315



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.

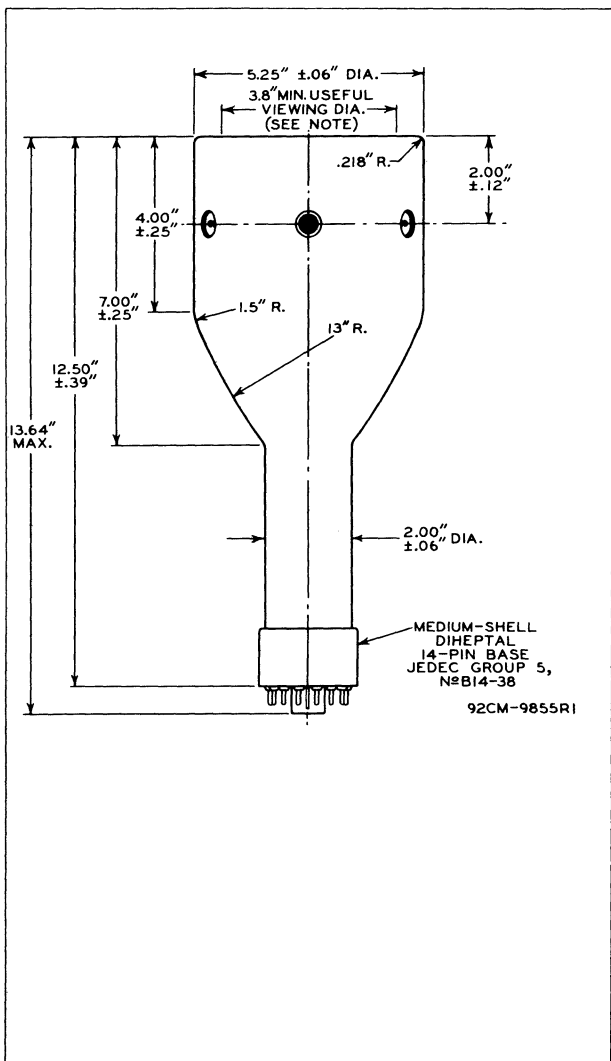
Failure of scanning while the writing beam is turned on may permanently damage the storage grid. Therefore, provision should be made to cut off automatically the writing-beam current in case of a scanning failure. The writing-beam current can be cut off by an electronic switch which applies -200 volts 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.



7315

7315

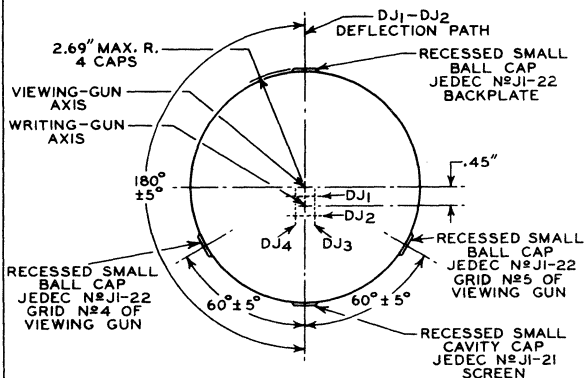
DISPLAY STORAGE TUBE





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 DJ₁ AND DJ₂ ARE NEARER THE SCREEN; DEFLECTING ELECTRODES DJ₃ AND DJ₄ ARE NEARER THE BASE. WITH DJ₁ POSITIVE WITH RESPECT TO DJ₂, THE SPOT WILL BE DEFLECTED TOWARD PIN 8; LIKewise, WITH DJ₃ POSITIVE WITH RESPECT TO DJ₄, THE SPOT WILL BE DEFLECTED TOWARD PIN 4.

THE ANGLE BETWEEN THE DEFLECTION PATH PRODUCED BY DJ₁ AND DJ₂ 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 DJ₁ - DJ₂ DEFLECTION PATH AND DJ₃ - DJ₄ DEFLECTION PATH IS $90^\circ \pm 3^\circ$.

THE ANGLE BETWEEN THE DEFLECTION PATH PRODUCED BY DJ₁ AND DJ₂ MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND THE SCREEN CAP BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$.



7315

7315

TYPICAL CHARACTERISTICS

VIEWING SECTION

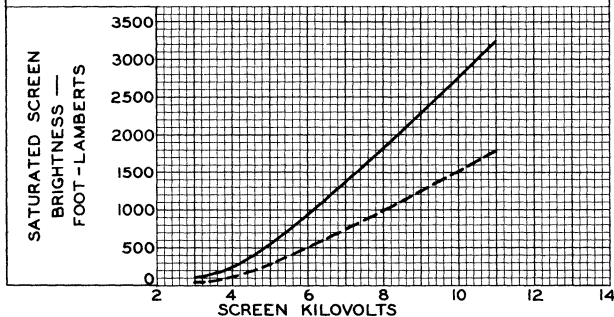
$E_f = 6.3$ VOLTS
 BACKPLATE VOLTS* = 2

GRID-№4 VOLTS* } ADJUSTED FOR
 GRID-№3 VOLTS* } BRIGHTEST, MOST
 GRID-№1 VOLTS* } UNIFORM DISPLAY.

— GRID-№5 VOLTS* = 210; GRID-№2 VOLTS* = 150
 - - - GRID-№5 VOLTS* = 150; GRID-№2 VOLTS* = 125

* REFERRED TO CATHODE OF VIEWING GUN.

WRITING SECTION
 NORMAL OPERATION



92CS-9858

TYPICAL STORAGE-GRID CHARACTERISTIC

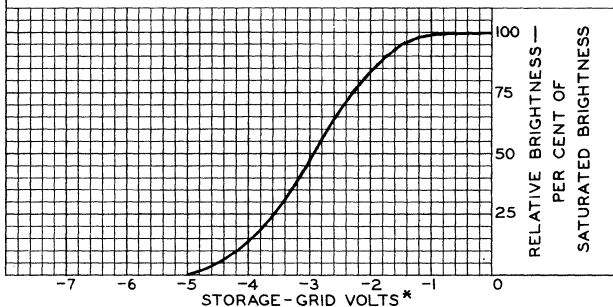
VIEWING SECTION

$E_f = 6.3$ VOLTS
 SCREEN VOLTS* = 10000
 BACKPLATE VOLTS* = 2
 GRID-№5 VOLTS* = 150

GRID-№4 VOLTS } ADJUSTED
 GRID-№3 VOLTS } FOR BEST
 GRID-№1 VOLTS } COLLIMATION.
 GRID-№2 VOLTS* = 125

* REFERRED TO CATHODE OF VIEWING GUN.

WRITING SECTION
 NORMAL OPERATION



92CS-9861

7315



7315

TYPICAL ERASURE CHARACTERISTIC

VIEWING SECTION

$E_f = 6.3$ VOLTS
 SCREEN VOLTS* = 10000
 BACKPLATE VOLTS* = 2
 GRID-№5 VOLTS* = 150

GRID-№4 VOLTS
 GRID-№3 VOLTS
 GRID-№1 VOLTS
 GRID-№2 VOLTS* = 125

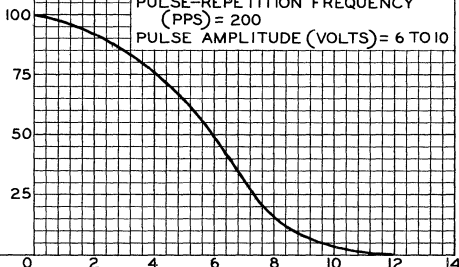
ADJUSTED
 FOR BEST
 COLLIMATION.

* REFERRED TO CATHODE OF VIEWING GUN.

ERASING CONDITIONS

PULSE SHAPE: RECTANGULAR
 PULSE DURATION (μ SEC) = 10 APPROX.
 PULSE-REPETITION FREQUENCY
 (PPS) = 200
 PULSE AMPLITUDE (VOLTS) = 6 TO 10

RELATIVE BRIGHTNESS —
 PER CENT
 OF SATURATED BRIGHTNESS



TIME AFTER WRITING TO SATURATED BRIGHTNESS—SECONDS

92CS-9860

WRITING-GUN-CURRENT CHARACTERISTIC

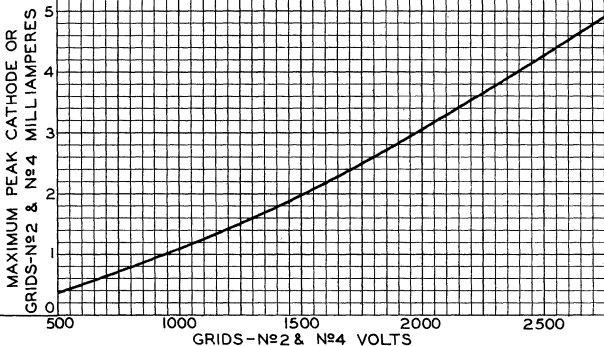
WRITING SECTION

 $E_f = 6.3$ VOLTS

GRID-№3 VOLTS* = ADJUSTED FOR FOCUS
 GRID-№1 VOLTS* = 0

* REFERRED TO CATHODE OF WRITING GUN.

VIEWING SECTION
 NORMAL OPERATION



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CS-9859



7448

DISPLAY STORAGE TUBE

7448

DIRECT-VIEW TYPE
3.8"-DIAMETER DISPLAYWRITING GUN:
ELECTROSTATIC DEFLECTION
ELECTROSTATIC FOCUSVIEWING GUN:
NO DEFLECTION
NO FOCUS

General:	DATA		
	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	$\mu\mu\text{f}$
Cathode to all other tube electrodes	5.5	8	$\mu\mu\text{f}$
Backplate to all other tube electrodes	-	116	$\mu\mu\text{f}$
Deflecting electrode DJ ₁ to deflecting electrode DJ ₂ . . .	1.9	-	$\mu\mu\text{f}$
Deflecting electrode DJ ₃ to deflecting electrode DJ ₄ . . .	2	-	$\mu\mu\text{f}$
DJ ₁ to all other tube electrodes.	6	-	$\mu\mu\text{f}$
DJ ₂ to all other tube electrodes.	7	-	$\mu\mu\text{f}$
DJ ₃ to all other tube electrodes.	5.5	-	$\mu\mu\text{f}$
DJ ₄ to all other tube electrodes.	4.8	-	$\mu\mu\text{f}$
Focusing Method	Electrostatic	None	
Deflection Method	Electrostatic	None	
Deflecting-Electrode Arrangement.	See Dimensional Outline	-	
Phosphor (For Curves, see front of this Section).			
Fluorescence.	-	P20, Aluminized	
Phosphorescence	-	Yellow-Green	
Minimum Useful Viewing Diameter ^v	-	-	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)		

7448

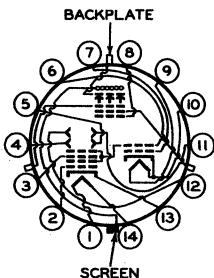


7448

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 DJ₃ of Writing Gun
 Pin 5—Deflecting Electrode DJ₄ 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 DJ₁ of Writing Gun
 Pin 12—Deflecting Electrode DJ₂ 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 VOLT-AGE (Peak).	—	20 max.**	volts
<i>Equivalent Values</i>		<i>Equivalent Values</i>	
GRID-No.5 VOLT-AGE	—	300 max.**	volts
GRID-No.4 VOLT-AGE	2950 max.** [▲] 200 max.**	300 max.**	volts
GRID-No.3 VOLT-AGE	1200 max.* -1550 max.**	{ 200 max.** 10 min.** }	volts
PEAK VOLTAGE BETWEEN GRID No.3 AND GRIDS No.2 & No.4.	— 2950 max.	—	volts



7448

7448

DISPLAY STORAGE TUBE

	Writing Section		Viewing Section		
GRID-No.2 VOLT-AGE	2950 max.** [▲]	200 max.**	2950 max.** [▲]	200 max.**	volts
CATHODE VOLT-AGE	-	-2750 max.**	-	-	volts
GRID-No.1 VOLT-AGE:					
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 DE-FLECTING 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

7448



7448

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_{C2+4}) between
1500 and 2750 volts[▲]

Grid-No.3 Voltage for focus.	17.5% to 37.5% of E_{C2+4}		volts
Maximum Grid-No.1 Voltage for cutoff of undeflected focused spot	-4.6% of E_{C2+4}		volts
Maximum Grid-No.3 Current.	-15 to +10		μ a
Maximum Cathode Current.	See Curve		
Deflection Factors:			
DJ ₁ & DJ ₂	36 to 48	v dc/in./kv of E_{C2+4}	
DJ ₃ & DJ ₄	35 to 47	v dc/in./kv of E_{C2+4}	
Focused Beam Position.	##		
Writing Speed ^{††}	300000		in./sec

Examples of Use of Design Ranges:*

For grids-No.2 & No.4 voltage (E_{C2+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



7448

7448

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.
- 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.

7448



7448

DISPLAY STORAGE TUBE

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.

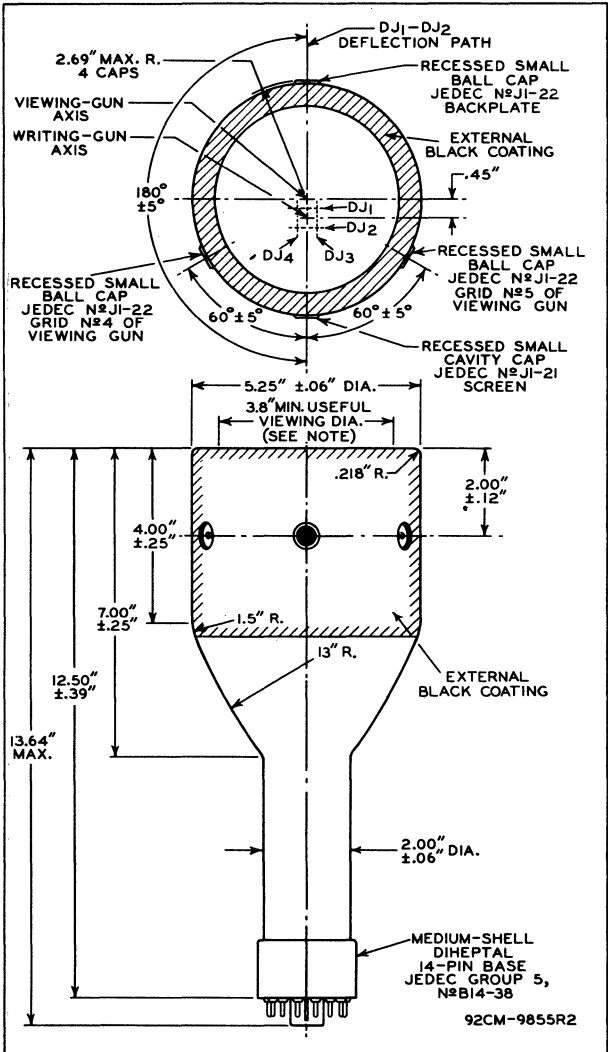
Failure of scanning while the writing beam is turned on may permanently damage the storage grid. Therefore, provision should be made to cut off automatically the writing-beam current in case of a scanning failure. The writing-beam current can be cut off by an electronic switch which applies -200 volts 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.



7448

7448

DISPLAY STORAGE TUBE



7448



7448

DISPLAY STORAGE TUBE

NOTE: MINIMUM USEFUL VIEWING AREA MAY BE ECCENTRIC WITH RESPECT TO THE TUBE FACE. THE MINIMUM USEFUL VIEWING AREA WILL HAVE DIAMETER OF 3.8".

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.

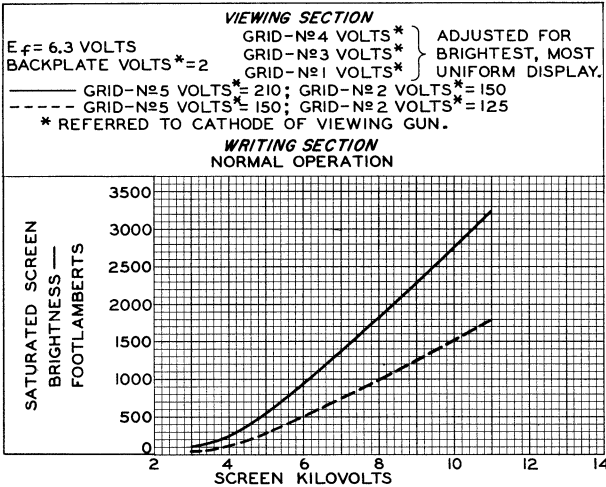
THE ANGLE BETWEEN THE DEFLECTION PATH PRODUCED BY DJ_1 AND DJ_2 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND THE BASE KEY BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^{\circ}$. THE ANGLE BETWEEN THE DEFLECTION PATH PRODUCED BY DJ_1 AND DJ_2 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND THE SCREEN CAP BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^{\circ}$. ANGLE BETWEEN $DJ_1 - DJ_2$ DEFLECTION PATH AND $DJ_3 - DJ_4$ DEFLECTION PATH IS $90^{\circ} \pm 3^{\circ}$.



7448

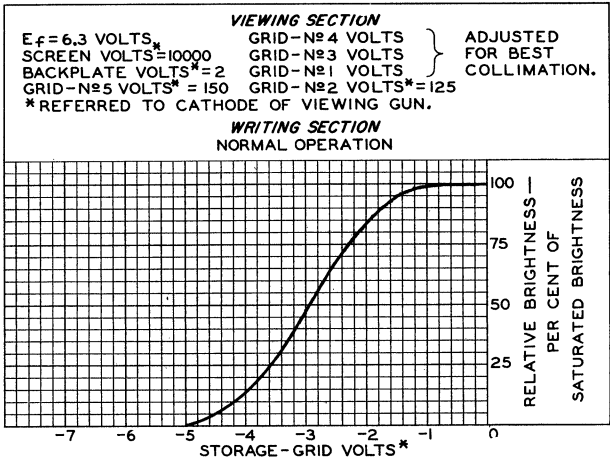
7448

TYPICAL CHARACTERISTICS



92CS-9858

TYPICAL STORAGE-GRID CHARACTERISTIC



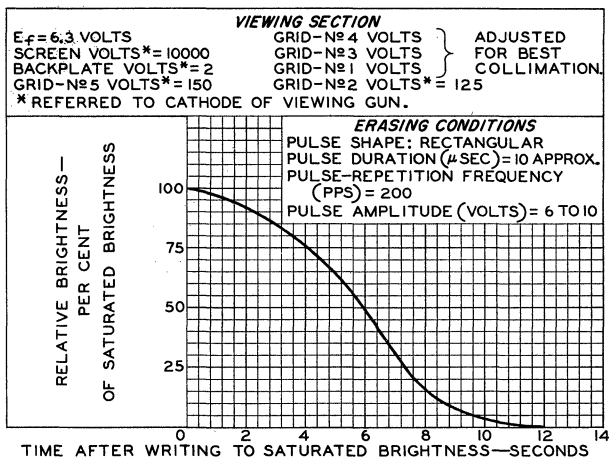
92CS-9861

7448



7448

TYPICAL ERASURE CHARACTERISTIC



92CS-9860

WRITING-GUN-CURRENT CHARACTERISTIC

