RCA TUBE
HANDBOOK
HB-3

CATHODE-RAY TUBE, STORAGE TUBE, & MONOSCOPE SECTION

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

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

Cathode-Ray Tubes, Storage Tubes, & Monoscopes

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	*Electrostatic Focus*
17CP4	17GP4
21AP4	17TP4
27MP4*	21MP4

Round Glass

Magnetic Focus		*Electrostatic Focus*
10BP4-A	16DP4-A	7JP4
10FP4-A*	16LP4-A	
12KP4-A*	16WP4-A	
12LP4-A		

Rectangular Glass

70° Deflection Angle (Diagonal)

Magnetic Focus	*Electrostatic Focus*
14EP4/14CP4/14BP4	14HP4
16RP4/16KP4	14QP4-A
16RP4-A/16KP4-A*	17HP4/17RP4
16TP4	17HP4-B/17RP4-C*
17BP4-A	17LP4/17VP4
17BP4-B*	17LP4-A/17VP4-B*
17QP4	20HP4-A/20MP4
17QP4-A*	20HP4-D*
20DP4-A/20CP4-A	21FP4-A
20DP4-C/20CP4-D*	21FP4-C*
21EP4-A	21YP4
21EP4-B*	21YP4-A*
21ZP4-A	
21ZP4-B*	

72° Deflection Angle (Diagonal)

Magnetic Focus	*Electrostatic Focus*
21AWP4*	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	*Electrostatic Focus*
21ACP4-A/21BSP4/21AMP4-A*	8DP4
24ADP4/24VP4-A/ 24CP4-A/24TP4*	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*
17BZP4*
17CDP4*
21CEP4*
21DAP4*
21DFP4*
24AHP4*

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 KINESCOPES

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

STORAGE TUBES

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

✠ Design-center values except as noted.

* Type having aluminized screen.

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

† Absolute value.

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

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

♠ Like footnote ♦ except projection-throw distance is 80'.

E = Electrostatic.

M = Magnetic.

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

FLYING-SPOT CATHODE-RAY TUBES

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

MONOSCOPES

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

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

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

OSCILLOGRAPH TUBES

Phosphor□	Approx. Bulb Dia. Inches	Max. Ultor Volts⊕	TUBE TYPE	Phosphor□	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				
P1	3	2500	3RP1	*Post-Deflection Accelerator Types*			
P1	3	2500	3RP1-A▲	P1	3	4000●	3JP1
P1	3	2500	3WP1	P1	5	6000●	5ABP1
P1	5	2000	5BP1-A	P1	5	6000●	5ADP1
P1	5	2500	5UP1	P1	5	4000●	5CP1-A
P1	7	4000	7VP1	P4	5	6000●	5ABP4
P2	1	1500	1EP2	P7	3	4000●	3JP7
P2	3	2500	3WP2	P7	5	6000●	5ABP7
P4	3	2500	3KP4	P7	5	4000●	5CP7-A
P4	3	2500	3RP4	P11	5	6000●	5ABP11
P5	3	1500	908-A	P11	5	4000●	5CP11-A
P7	3	2500	3KP7	P12	5	4000●	5CP12
Magnetic-Deflection Types							
Magnetic-Focus Types				*Electrostatic-Focus Types*			
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▲
5TP4	**5TP4**
7JP4	7JP4
8DP4	8DP4
10BP4 10BP4A	10BP4A
10BP4C **10BP4D** 10CP4	●**10FP4A**
10EP4	●10BP4A
10FP4 **10FP4A**	**10FP4A**
12JP4	●**12KP4A**
12KP4 **12KP4/ 12ZP4** **12KP4A**	**12KP4A**
12LP4 12LP4A **12LP4C**	12LP4A
12LP4C 12QP4 12QP4A	●**12KP4A**
12TP4	●12LP4A
12ZP4 **12ZP4A**	●**12KP4A**
14ATP4	**14ATP4**
14BAP4	**14BAP4**
14BP4 14BP4A 14CP4 **14CP4A**	14EP4
14DP4	●14EP4
14EP4 14EP4/ 14CP4 14EP4/ 14CP4/ 14BP4	14EP4
14HP4	14HP4
14NP4 **14NP4A**	●**14WP4**

Type to be Replaced	Replace by RCA Type▲
14QP4 **14QP4A**	**14QP4A**
14RP4 **14RP4A** **14SP4**	●**14WP4**
14UP4	●14EP4
14WP4 **14WP4/ 14ZP4** **14ZP4** **14ZP4/ 14WP4**	**14WP4**
16AP4 16AP4A	16AP4A
16CP4	●16LP4A
16DP4 16DP4A	16DP4A
16GP4 16GP4A 16GP4B 16GP4C	16GP4B
16KP4 **16KP4A**	**16RP4A**
16LP4 16LP4A	16LP4A
16QP4	●**16RP4A**
16RP4 16RP4/ 16KP4 **16RP4A** **16RP4A/ 16KP4A**	**16RP4A**
16SP4 16SP4A	●16WP4A
16TP4	16TP4
16UP4	●**16RP4A**
16VP4 16WP4 16WP4/ 16YP4	●16WP4A
16WP4A	16WP4A

▲ 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▲
16WP4B	16WP4A
16XP4	**●16RP4A**
16YP4	●16WP4A
16ZP4	●16LP4A
17AP4	**●17BP4B**
17ATP4 17ATP4/ 17AVP4 **17ATP4A** **17ATP4A/** **17AVP4A** 17AVP4 17AVP4/ 17ATP4 **17AVP4A** **17AVP4A/** **17ATP4A**	**●17BJP4**
17BJP4	**17BJP4**
17BP4	**●17BP4B**
17BP4A **17BP4B** 17BP4C	**17BP4B**
17BRP4	**●17BZP4**
17BUP4	**●17BJP4**
17BVP4	**●17CSP4**
17BWP4	**17CSP4**
17BZP4 **17BZP4/** **17CAP4/** **17CKP4** **17BZP4/** **17CAP4/** **17CKP4/** **17BRP4** **17CAP4**	**17BZP4**
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 **17DZP4**	**17DXP4**
17GP4	17GP4
17HP4 17HP4/ 17RP4 17HP4A **17HP4B** **17HP4B/** **17RP4C**	**17HP4B**
17JP4	**17BP4B**
17LP4 17LP4/ 17VP4 **17LP4A** **17LP4A/** **17VP4B**	**17LP4A**
17QP4 **17QP4A**	**17QP4A**
17RP4 **17RP4C**	**17HP4B**
17TP4	17TP4
17UP4	**17QP4A**
17VP4 17VP4/ 17LP4 **17VP4B**	**17LP4A**
17YP4	**17QP4A**
19AFP4	**19AFP4**
19AJP4	**19AJP4**
19ANP4	**19ANP4**

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Picture-Tube Replacement Guide

Bold-Face Type Indicates an Aluminized Tube

Type to be Replaced	Replace by RCA Type▲
19AP4 19AP4A 19AP4B **19AP4C** 19AP4D	19AP4B
19AVP4	**19AVP4**
19AXP4 **19AYP4**	**19AYP4**
19BDP4	**19BDP4**
19BFP4	**19BFP4**
19BTP4	**19BTP4**
19XP4	**19XP4**
19YP4	**19YP4**
20CP4 20CP4A **20CP4B** 20CP4C **20CP4D** 20DP4	●**20DP4C**
20DP4A 20DP4A/ 20CP4A	**20DP4C**
20DP4B	●**20DP4C**
20DP4C **20DP4C/ 20CP4D**	**20DP4C**
20HP4	●**20HP4D**
20HP4A 20HP4A/ 20LP4 20HP4A/ 20MP4	**20HP4D**
20HP4B **20HP4C**	●**20HP4D**
20HP4D 20LP4 20MP4	**20HP4D**
21ACP4 21ACP4/ 21AMP4 **21ACP4A**	**21AMP4A**

Type to be Replaced	Replace by RCA Type▲
21ACP4A/ 21AMP4A **21ACP4A/ 21BSP4** **21ACP4A/ 21BSP4/ 21AMP4A**	**21AMP4A**
21AFP4	●**21YP4A**
21ALP4 **21ALP4A** **21ALP4B** **21ALP4B/ 21ALP4A**	●**21CBP4A**
21AMP4 **21AMP4A**	**21AMP4A**
21ANP4 **21ANP4A**	●**21CBP4A**
21AP4	21AP4
21AQP4 **21AQP4A**	●**21AMP4A**
21ASP4	●**21XP4A**
21ATP4 **21ATP4A** **21ATP4A/ 21ATP4** 21ATP4B	●**21CBP4A**
21AUP4 **21AUP4A** **21AUP4B** **21AUP4B/ 21AUP4A** 21AVP4 21AVP4/ 21AUP4 **21AVP4A** **21AVP4B** **21AVP4B/ 21AVP4A** **21AVP4B/ 21AUP4B/ 21AVP4A/ 21AUP4A**	**21AVP4B**
21AWP4	**21AWP4**

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Picture-Tube Replacement Guide

Bold-Face Type Indicates an Aluminized Tube

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

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

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Bold-Face Type Indicates an Aluminized Tube

Type to be Replaced	Replace by RCA Type▲
23UP4	**23UP4**
23WP4	**23MP4**
23XP4 **23YP4**	**23YP4**
24ADP4 **24ADP4/** **24VP4A/** **24CP4A/** **24TP4**	**24CP4A**
24AEP4	**24AEP4**
24AHP4	**24AHP4**
24ALP4	**24AHP4**
24ANP4	●**24AEP4**
24ATP4	**24ATP4**
24AUP4	**24AUP4**
24BAP4	**24BAP4**
24CP4 **24CP4A**	**24CP4A**

Type to be Replaced	Replace by RCA Type▲
24DP4 **24DP4A** **24DP4A/** **24YP4**	●**24AEP4**
24QP4	●**24CP4A**
24TP4 24VP4 **24VP4A**	**24CP4A**
24XP4	●**24CP4A**
24YP4	●**24AEP4**
24ZP4	**24AEP4**
27EP4 27GP4	●**27RP4**
27MP4	**27MP4**
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.

FEATURES OF FLUORESCENT SCREENS

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

Phosphor P1 produces a brilliant spot having yellowish-green fluorescence and medium persistence. Types having this phosphor are particularly useful for general oscillographic applications in which recurrent-wave phenomena are to be observed visually.

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

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

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

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

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

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

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

FEATURES OF FLUORESCENT SCREENS

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

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

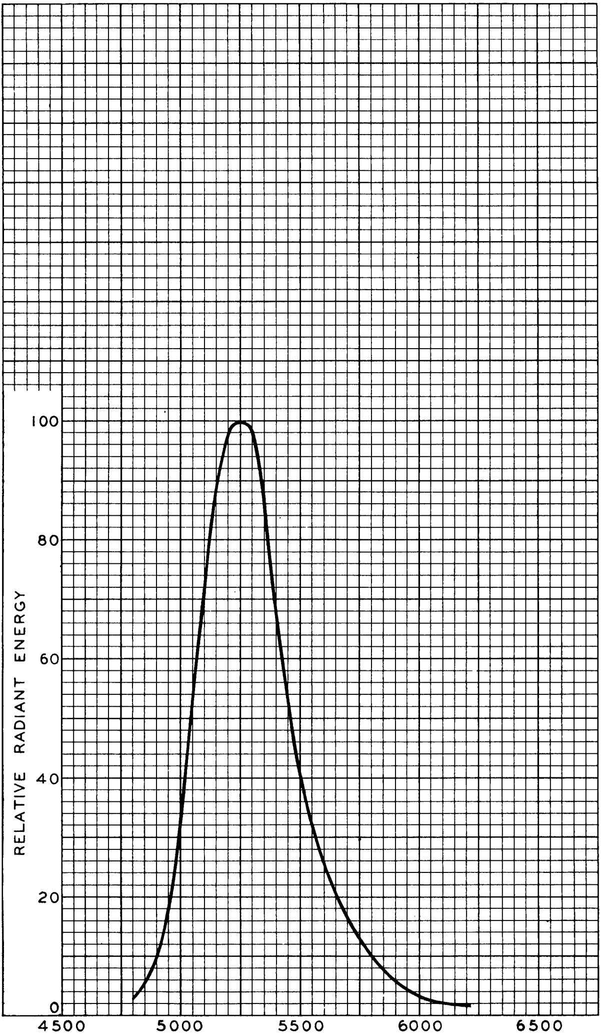
Phosphor P20 has high luminous efficiency, yellow-green fluorescence and medium-short persistence. The screen may be used in applications requiring relatively short persistence and good visual efficiency.

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

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

![RCA logo]

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P1



DEC.14,1948

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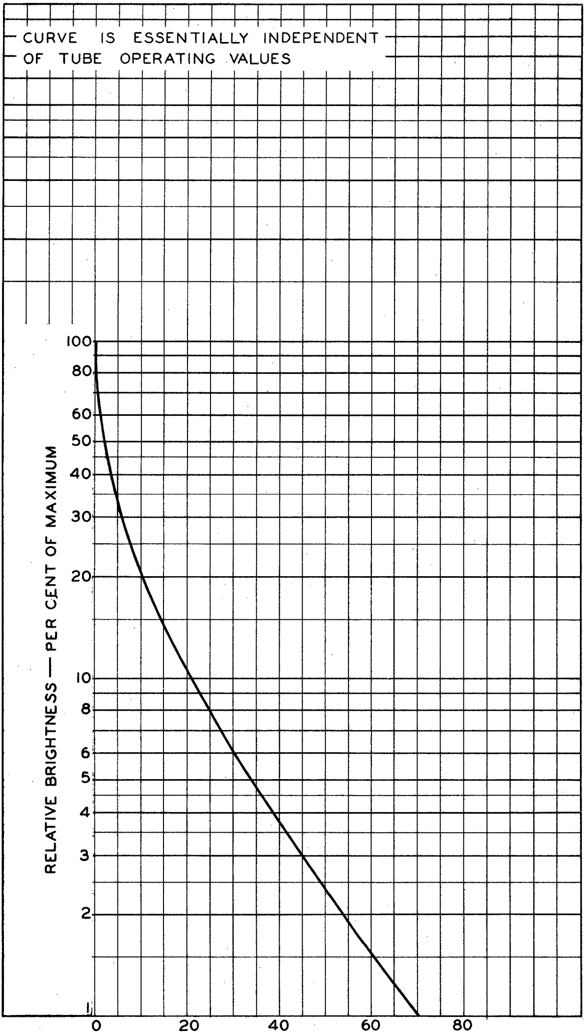
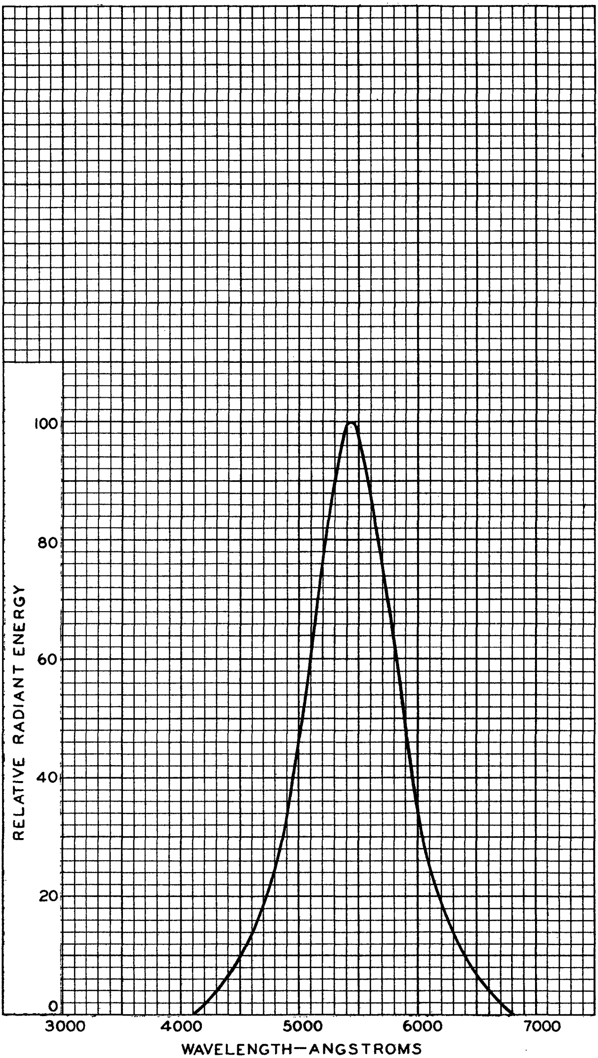
92CM-5372R1

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P1



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P2



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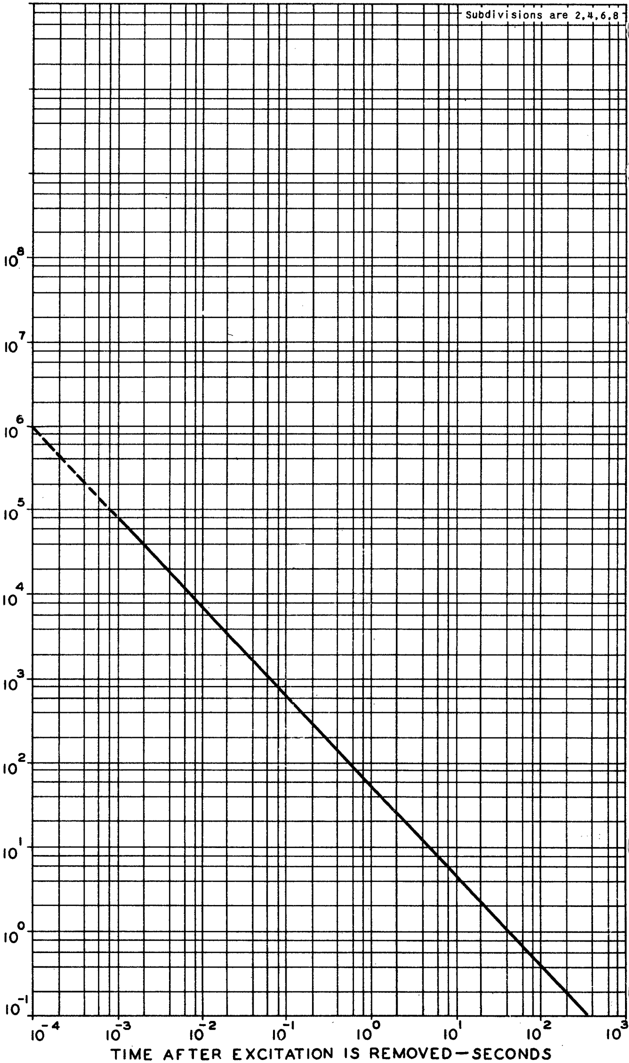
92CM-7312

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P2



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92CM-7321

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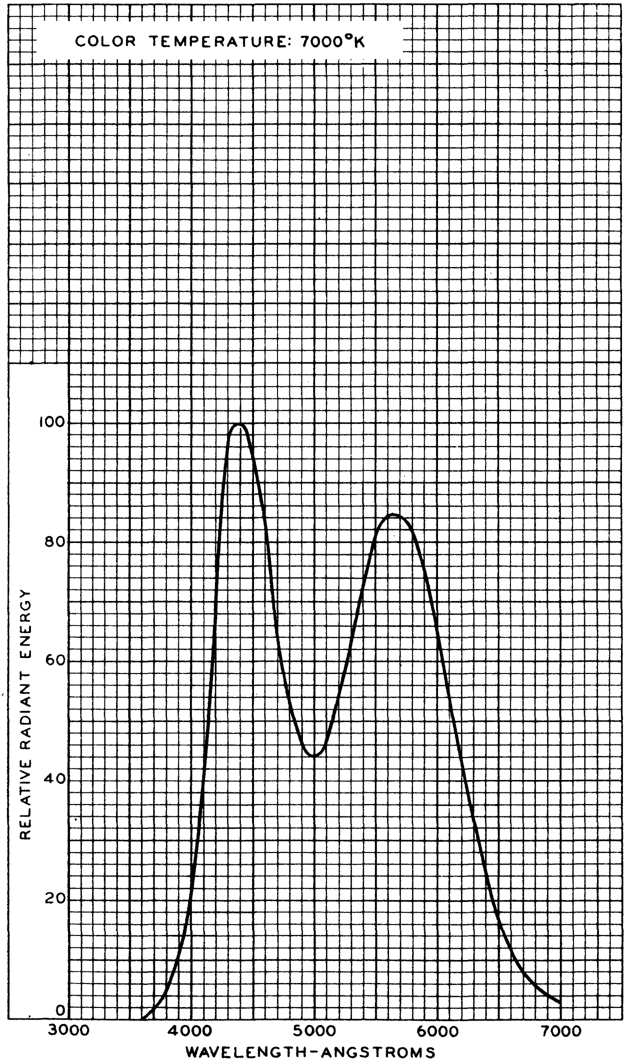
SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P4
SULFIDE TYPE



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92CM-7316

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P4
SULFIDE TYPE

FOR KINESCOPES

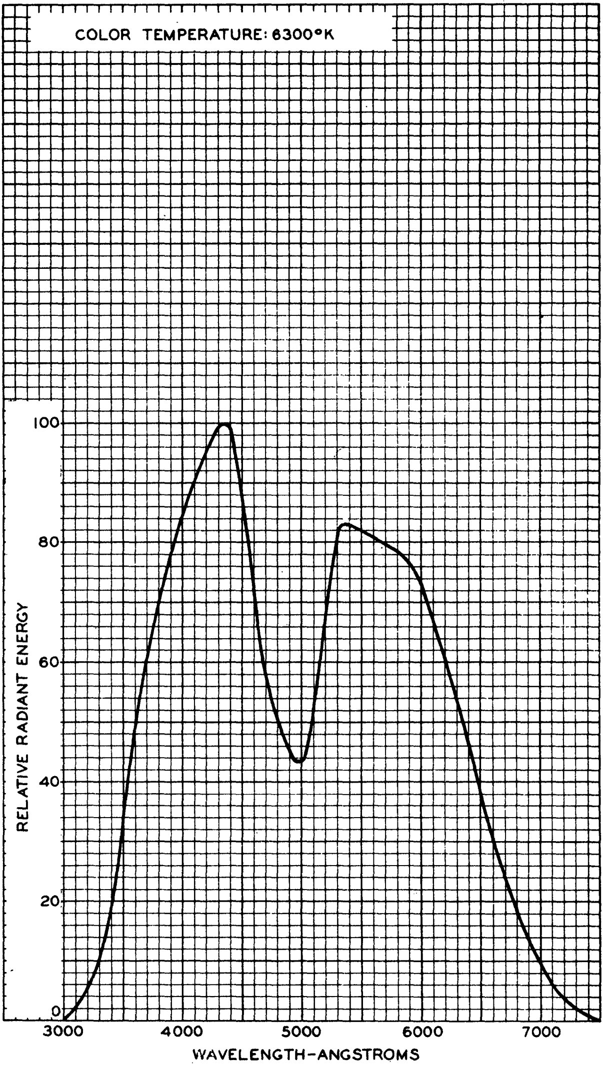
The persistence of the phosphorescence is such that its brightness does not exceed 7 per cent of the peak value in 33 milliseconds after excitation is removed.

FOR OSCILLOGRAPH TUBES

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

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR № 4
SILICATE-SULFIDE TYPE



MARCH 6, 1950

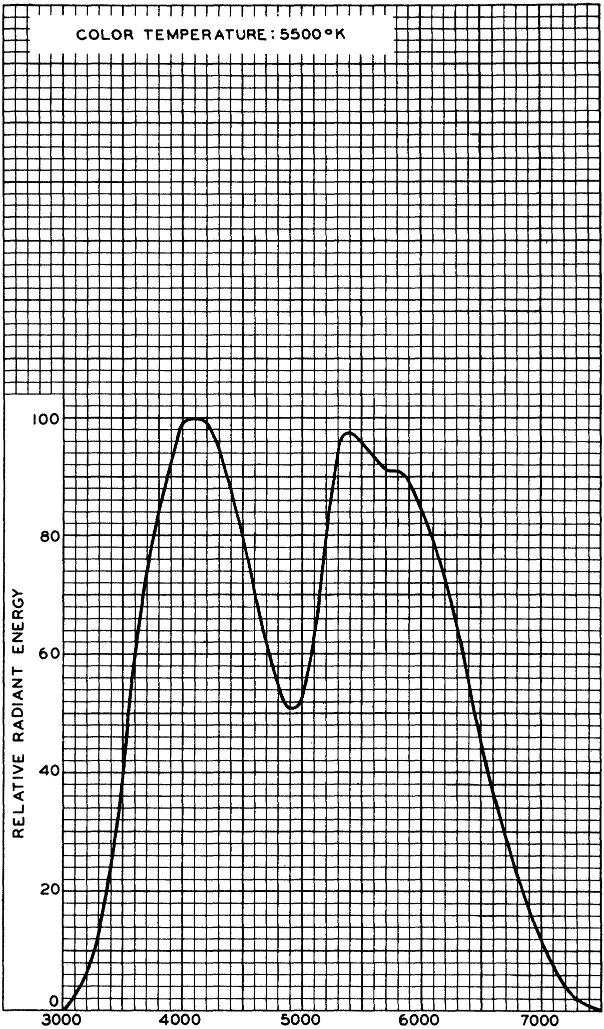
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7458

PERSISTENCE CHARACTERISTIC OF PHOSPOR № 4
SILICATE-SULFIDE TYPE

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

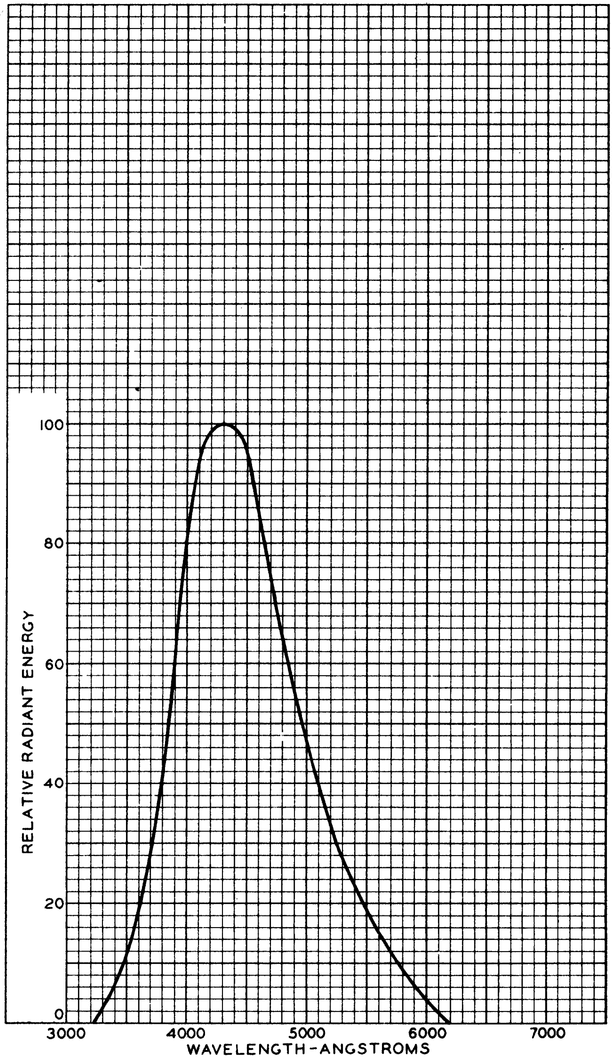
SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P4
SILICATE TYPE

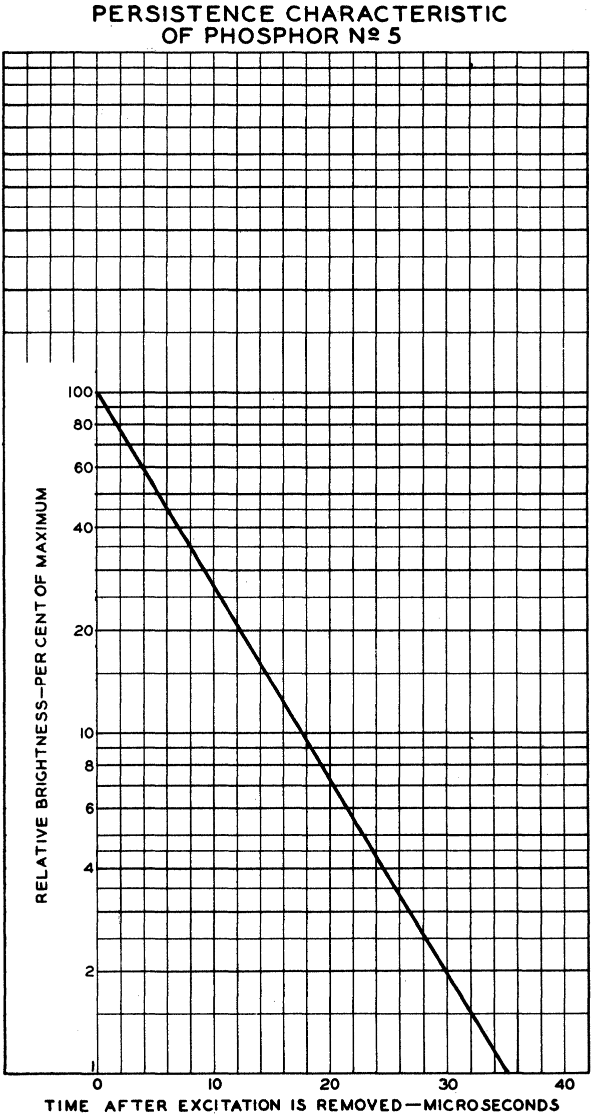


PERSISTENCE CHARACTERISTIC OF PHOSPOR P4
SILICATE TYPE

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





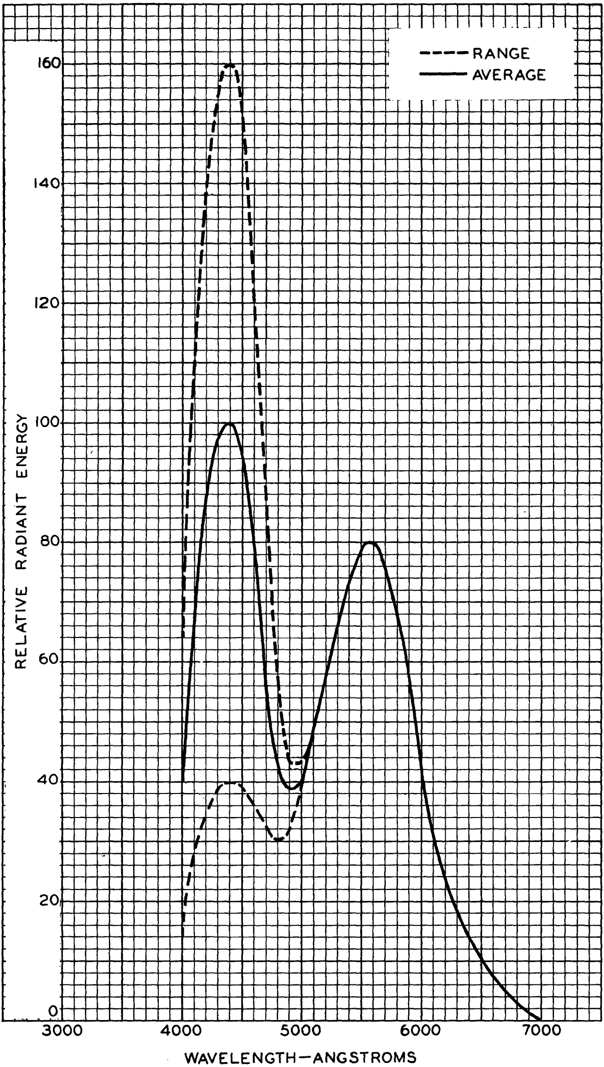
MAY 3, 1949

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7266

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P7

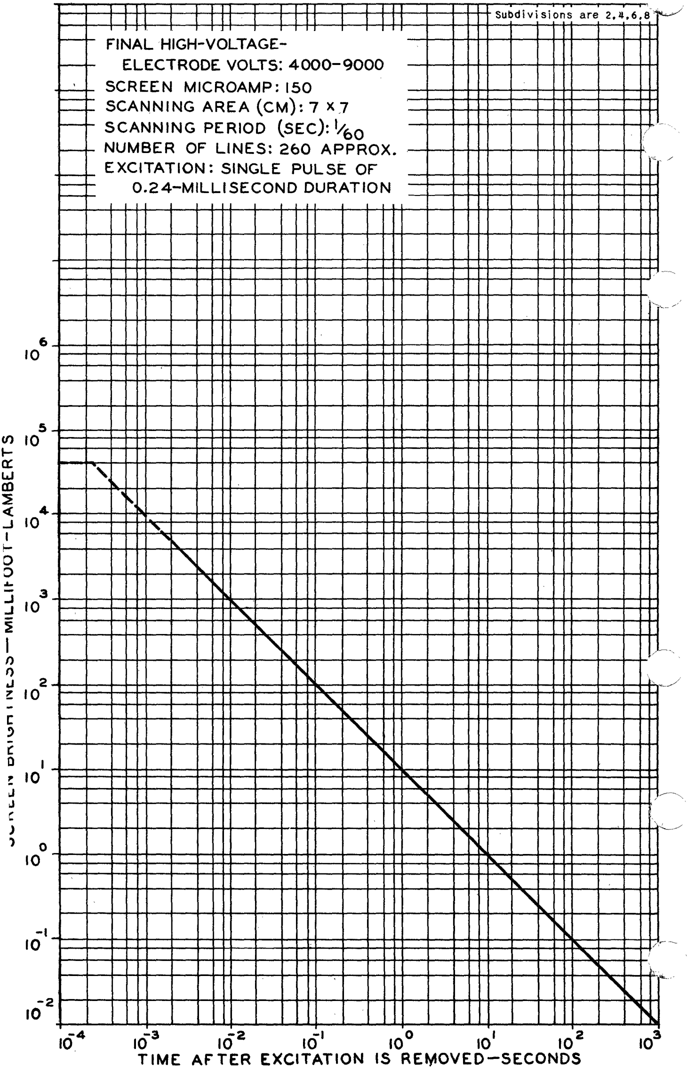


92CM-7336

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P7



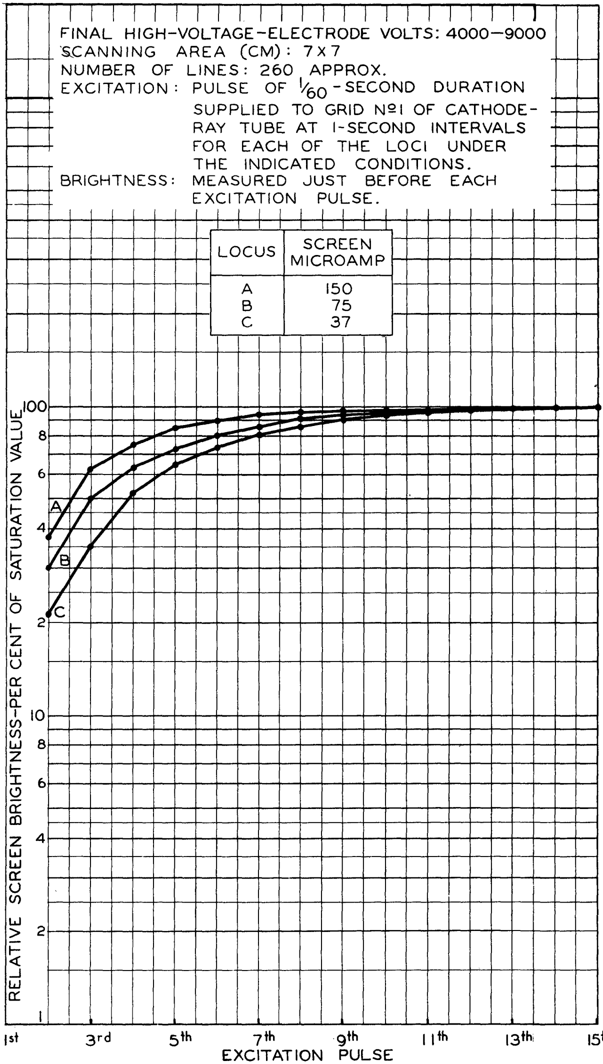
TUBE DIVISION

92CM-7015R4

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

![RCA]

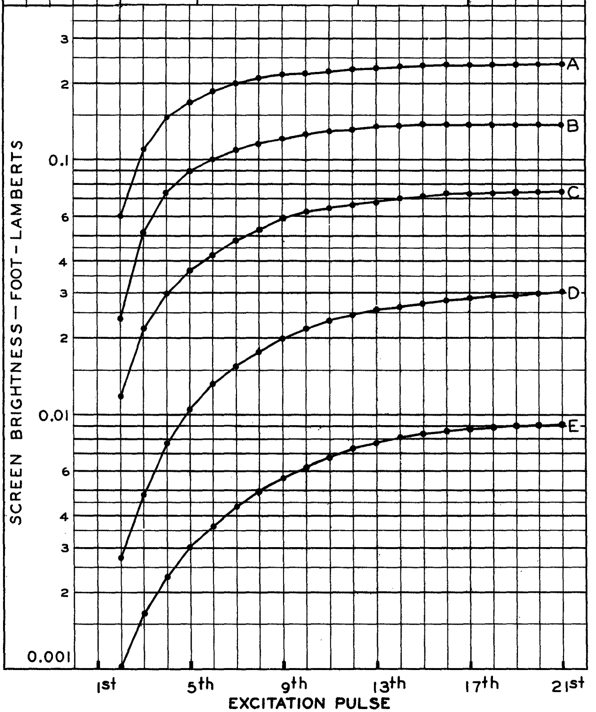
BUILDUP CHARACTERISTICS OF PHOSPHOR P7



BUILDUP CHARACTERISTICS OF PHOSPHOR P7

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

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

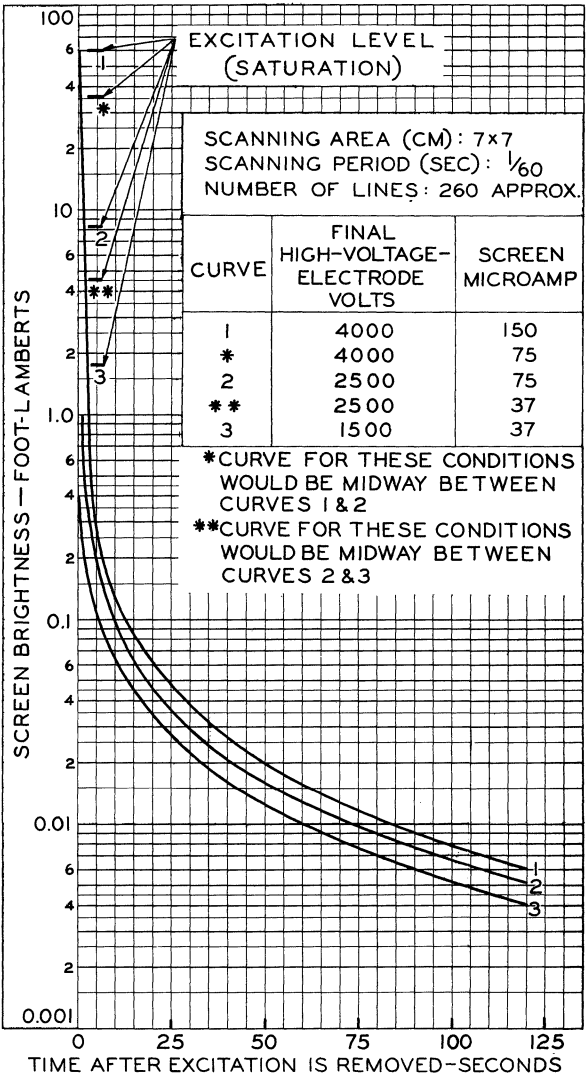


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6805R5

RCA

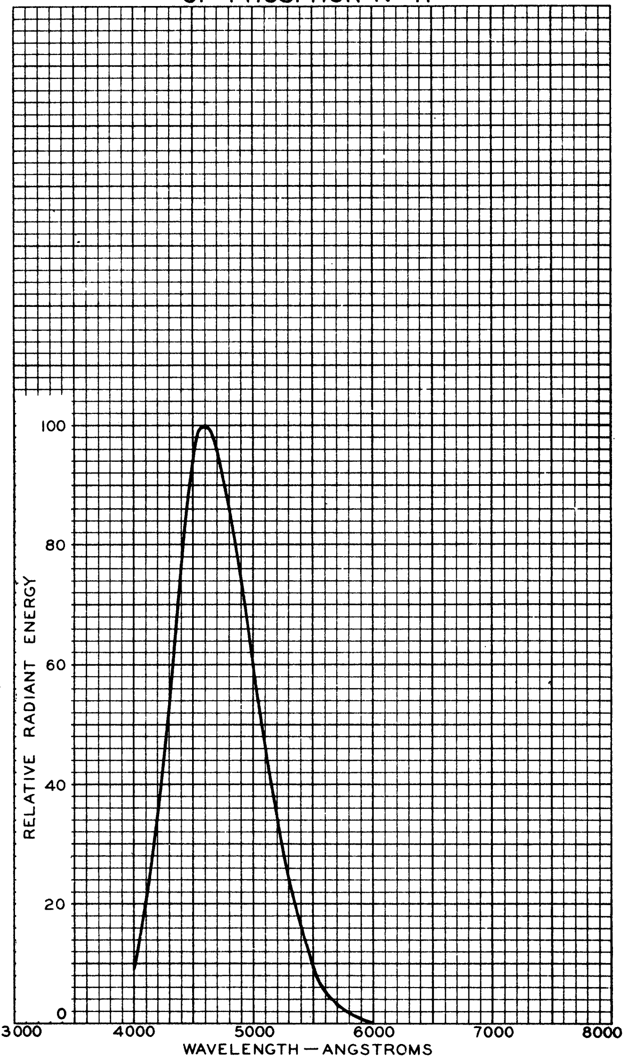
PERSISTENCE CHARACTERISTICS OF PHOSPHOR P7



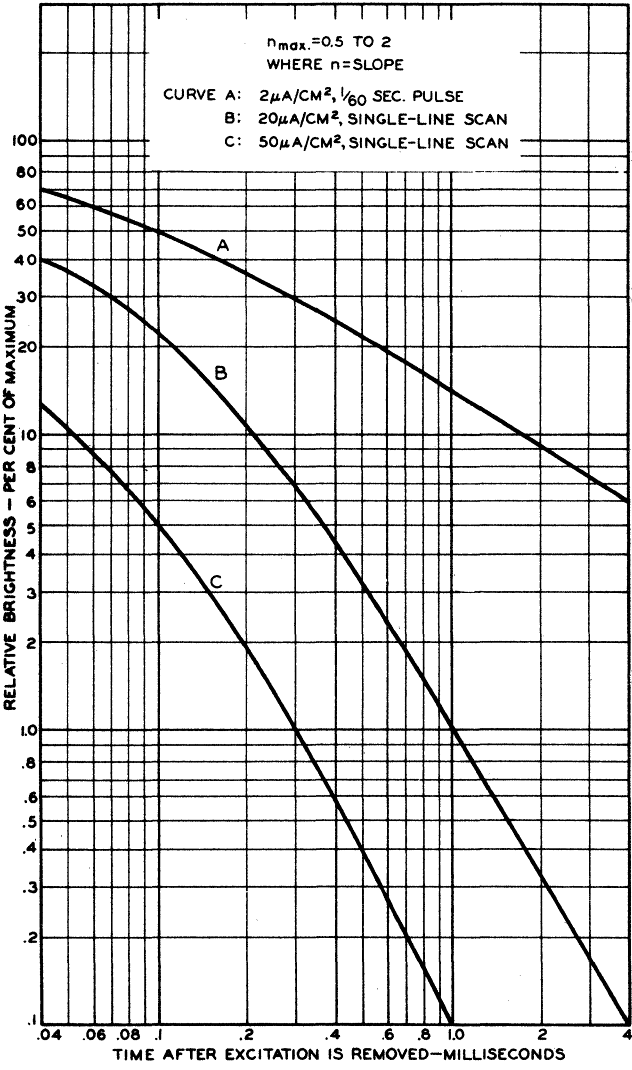
TUBE DIVISION 92CL-6804R5

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR Nº 11



PERSISTENCE CHARACTERISTICS OF PHOSPHOR No. 11

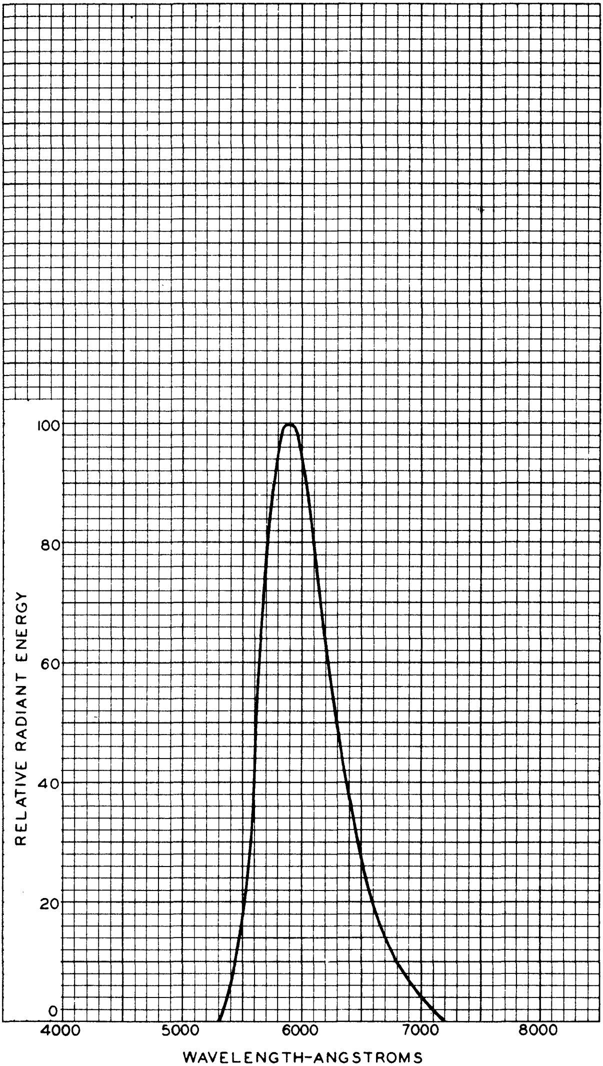


JULY 7, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6806R2

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P12

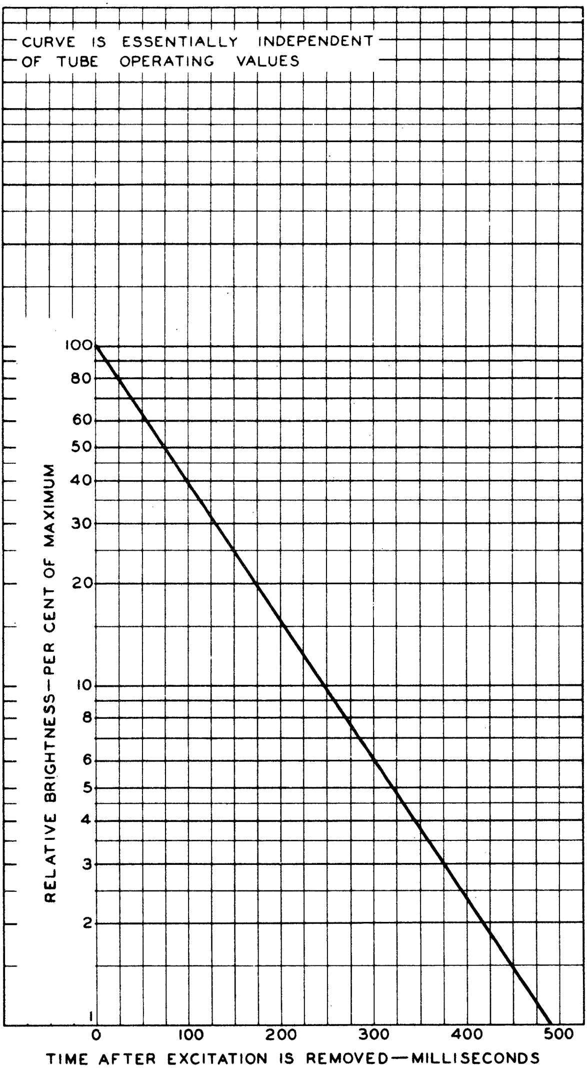


JULY 18, 1949

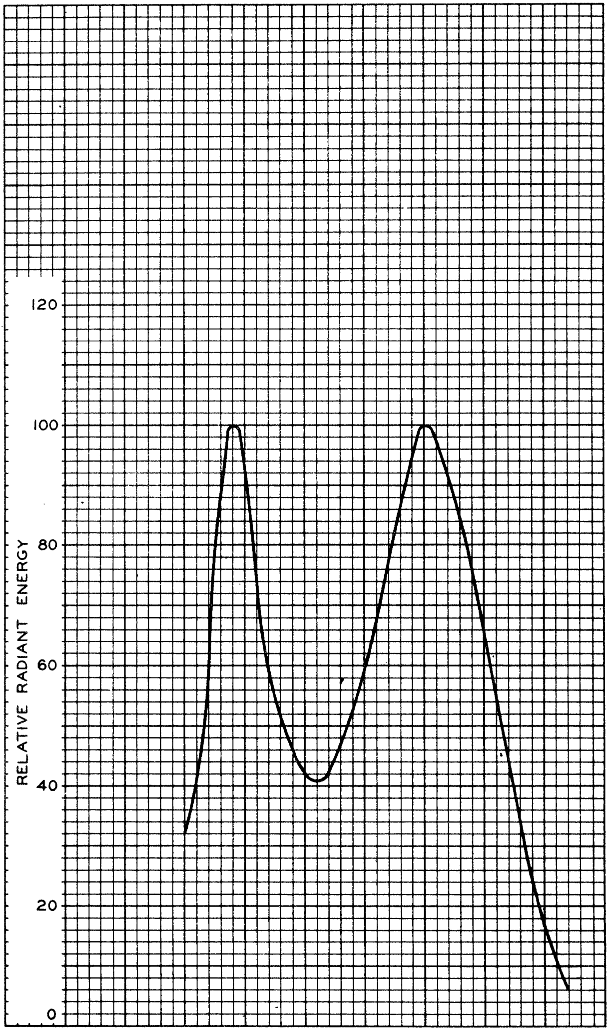
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7317

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P12



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P14

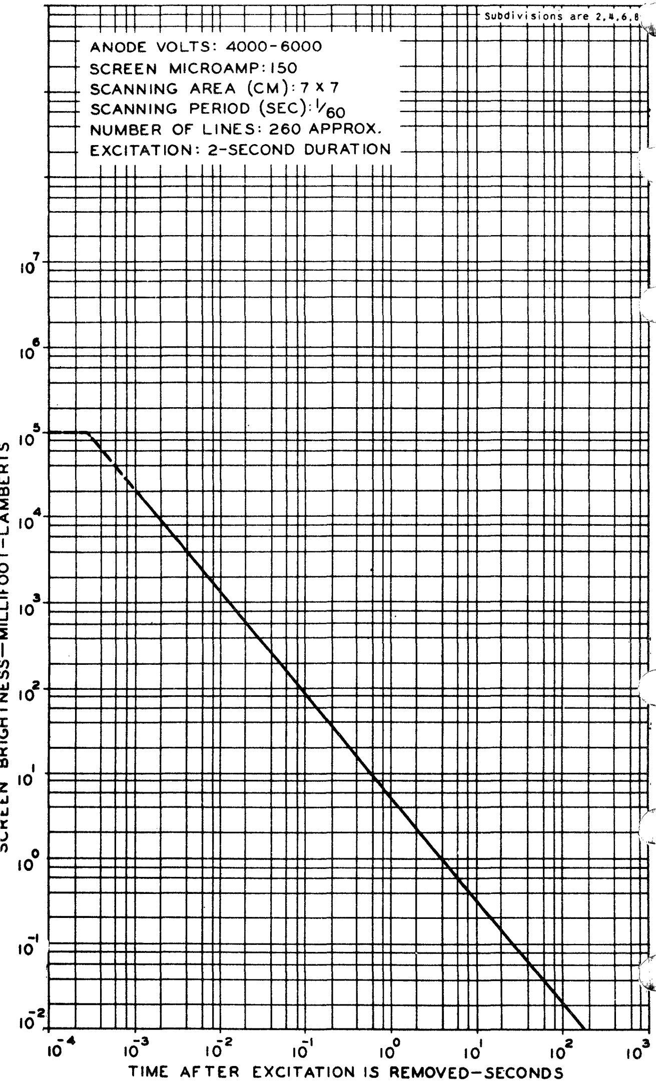


AUG. 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7675

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P14



JAN. 26, 1951

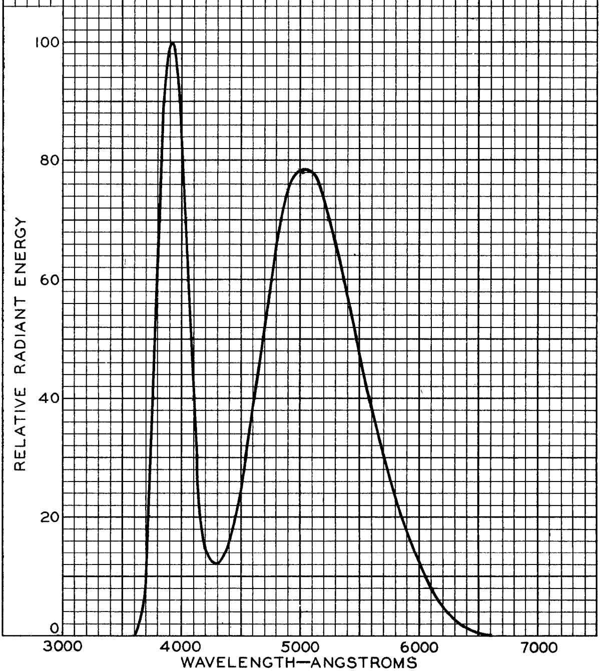
TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7326R1

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P15

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



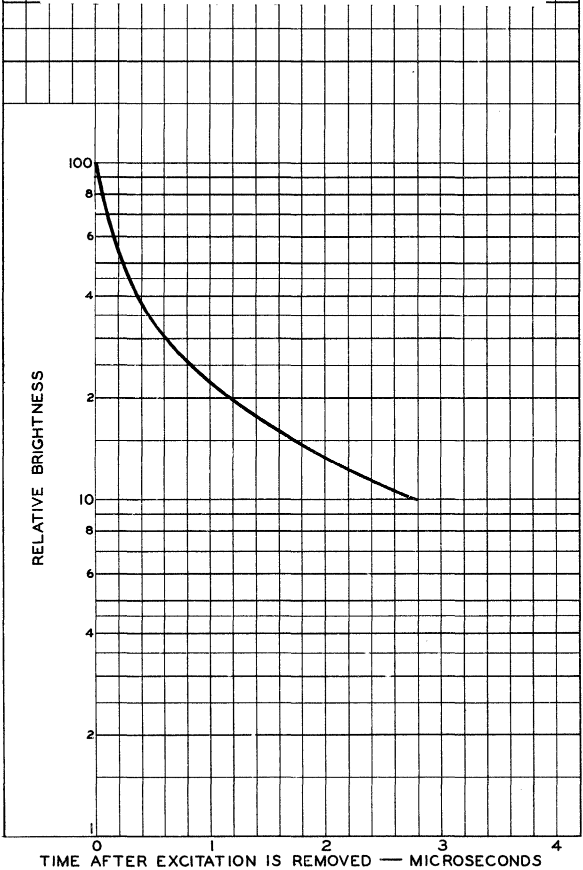
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6915R1

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P15

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

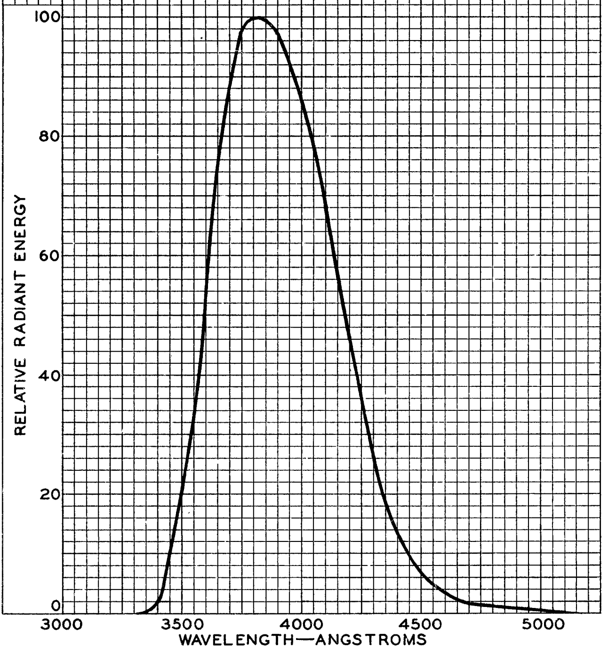
SPOT: SHARPLY FOCUSED.



RCA

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P16

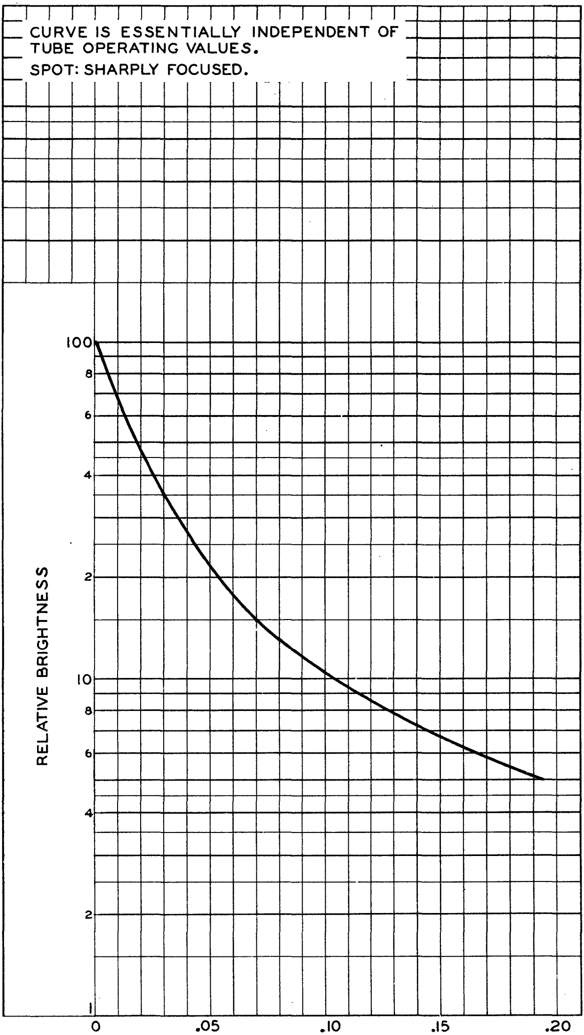
COMPONENT	COLOR	I.C.I. COORDINATES X	I.C.I. COORDINATES Y
VISIBLE	VIOLET	0.175	0.003
NEAR ULTRAVIOLET	——	——	——



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

92CM-7563RI

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P16

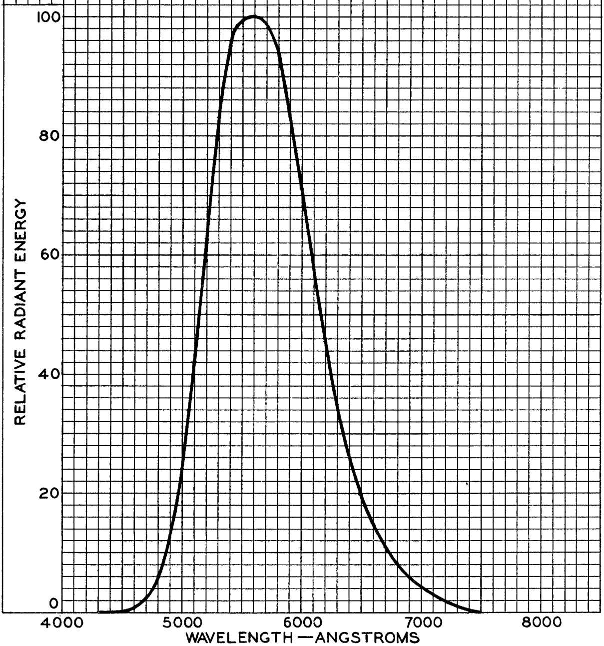


ELECTRON TUBE DIVISION 92CM—7564R1

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

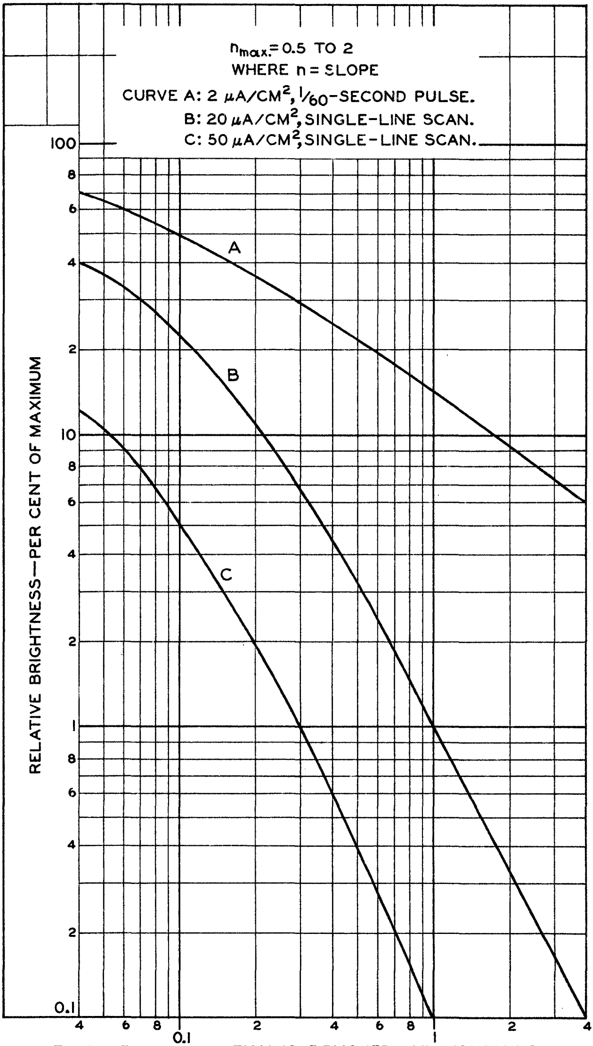


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7647R1

RCA

PERSISTENCE CHARACTERISTICS OF PHOSPHOR P20



ELECTRON TUBE DIVISION 92CM-6806R2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

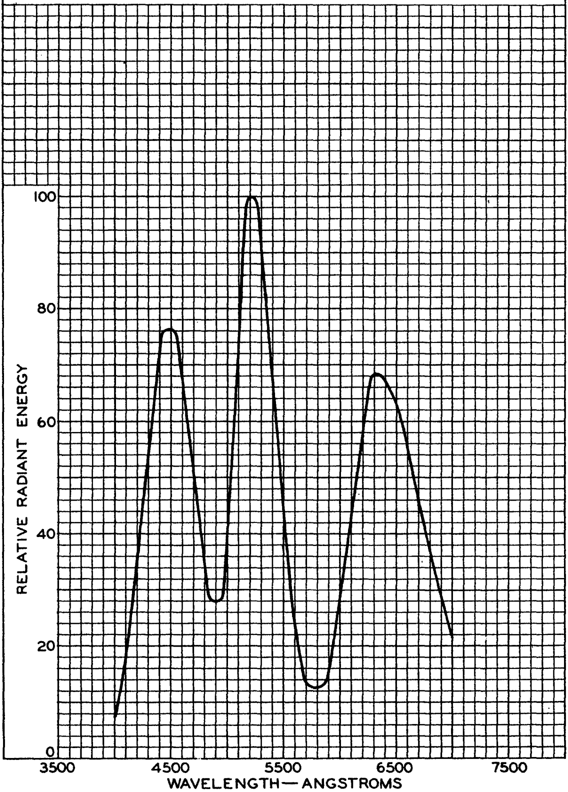
Group Phosphor P22

SPECTRAL-ENERGY EMISSION CHARACTERISTIC

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

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

*JEDEC COLOR CLASSIFICATION CORRESPONDING TO CIE COORDINATE VALUES.

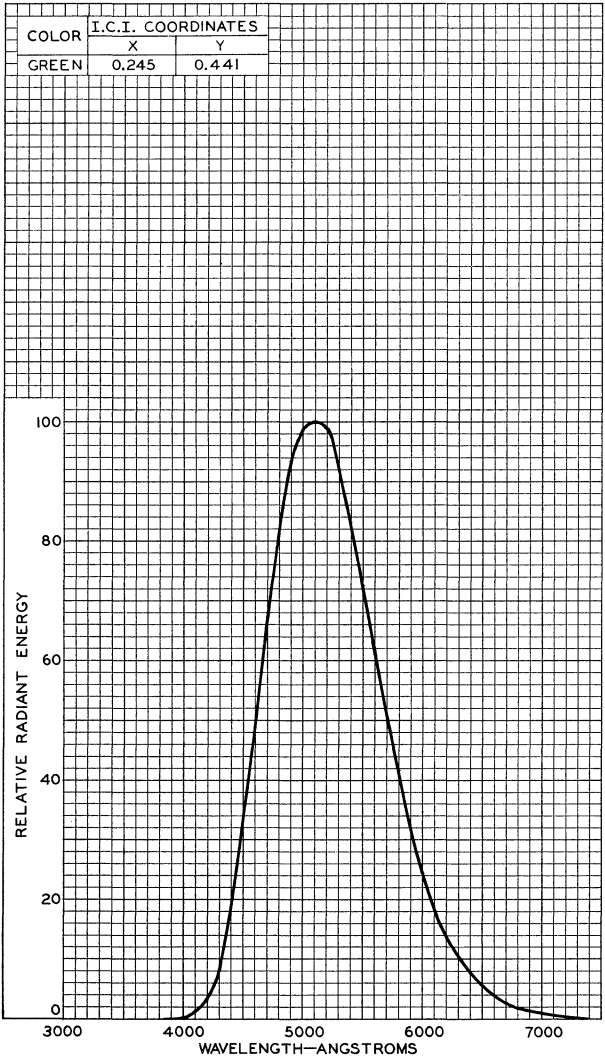


92CM-7969R4

PERSISTENCE CHARACTERISTIC

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

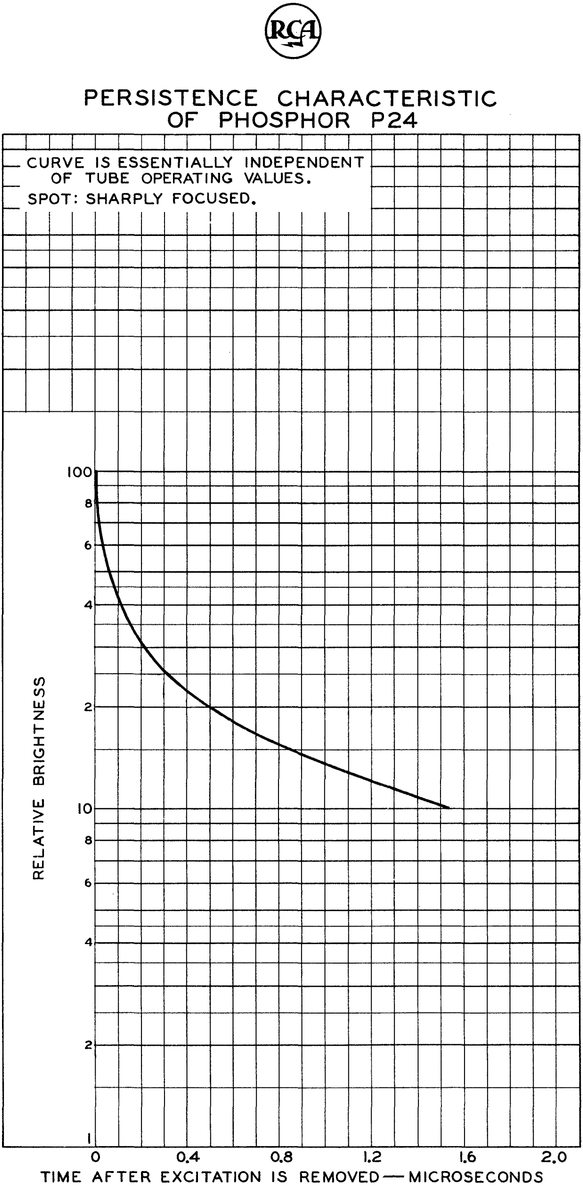
SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P24



ELECTRON TUBE DIVISION

92CM-8204R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-8205R2

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.

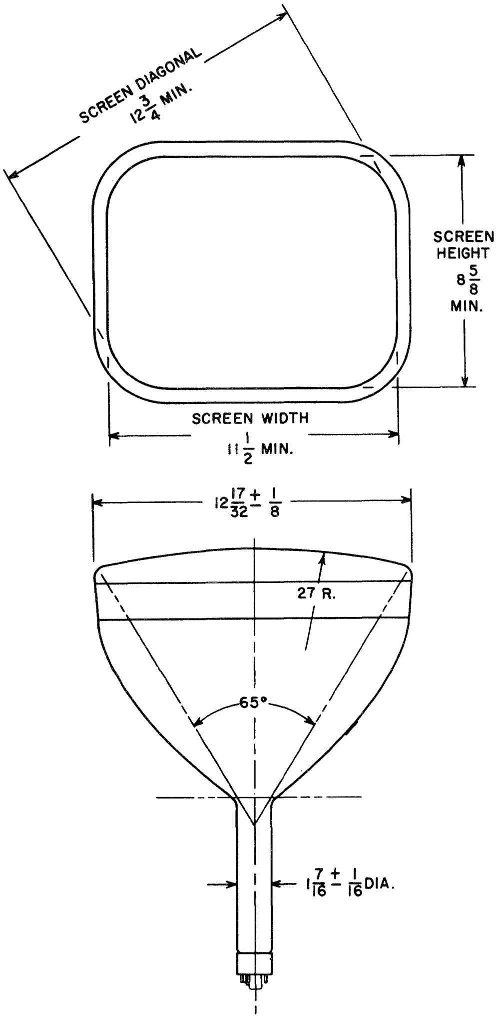
Contact Area for Grounding

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.

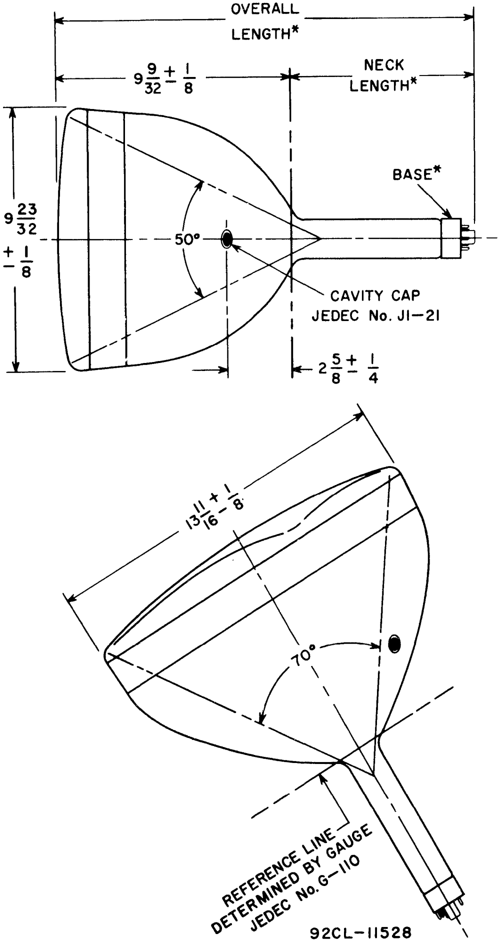
Special. Indicates that one or more contact areas for grounding the external conductive coating other than the area near the reference line are provided in the industry specification for the tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J109-1/2 A/C

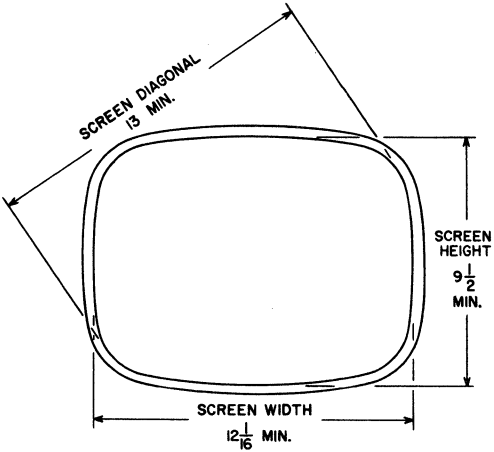


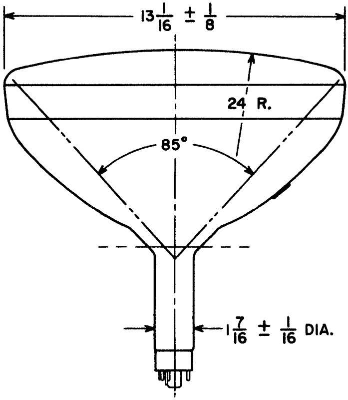
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

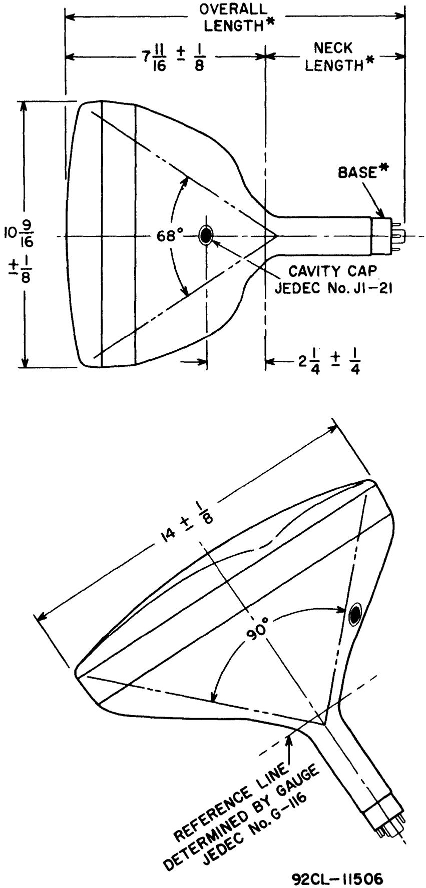
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J112 A/B

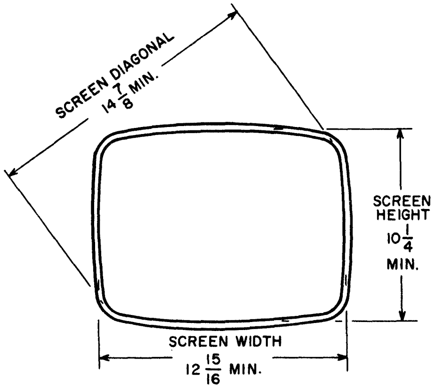


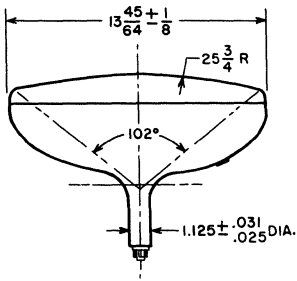
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

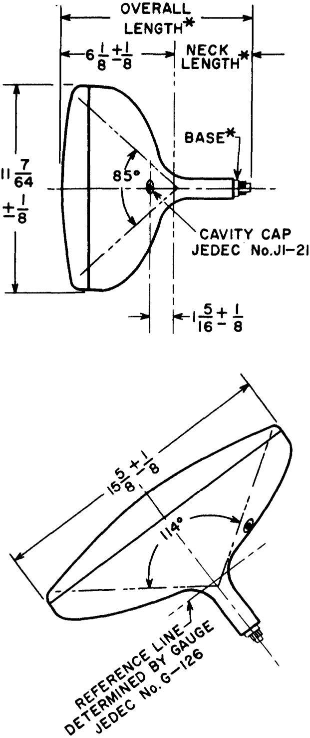
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J125 C2

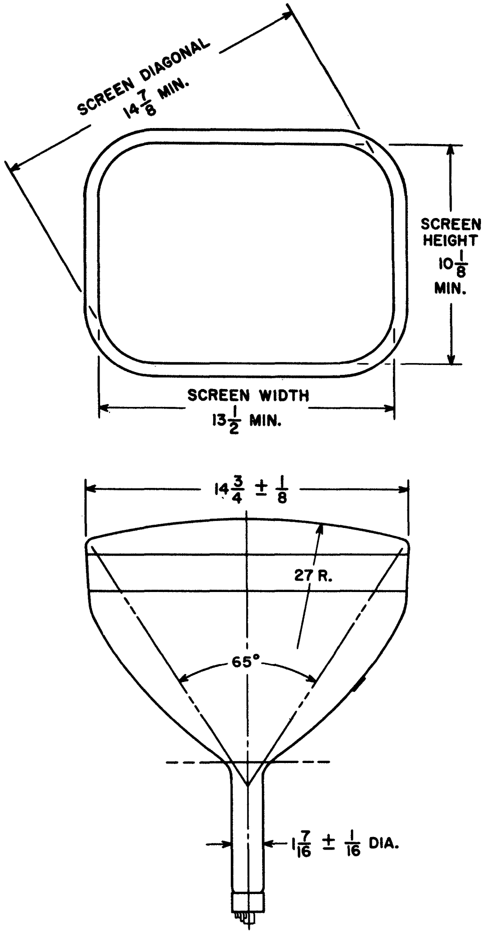


ALL DIMENSIONS IN INCHES

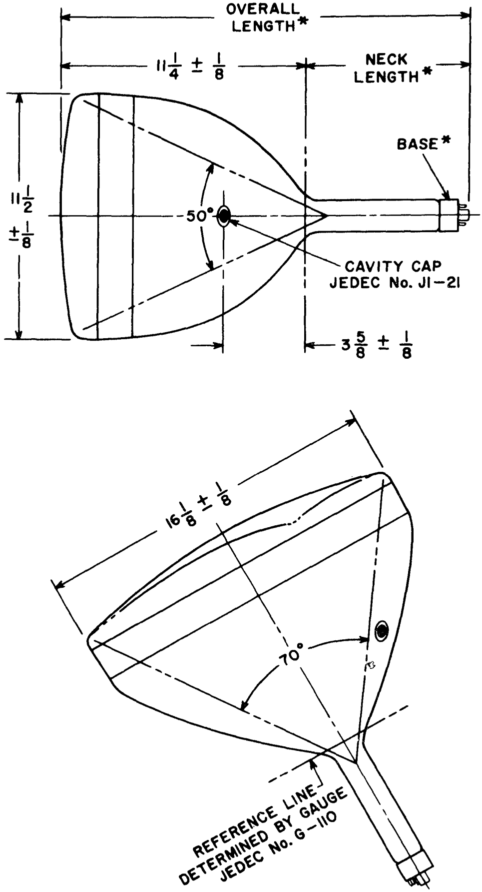
* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J129 A/B



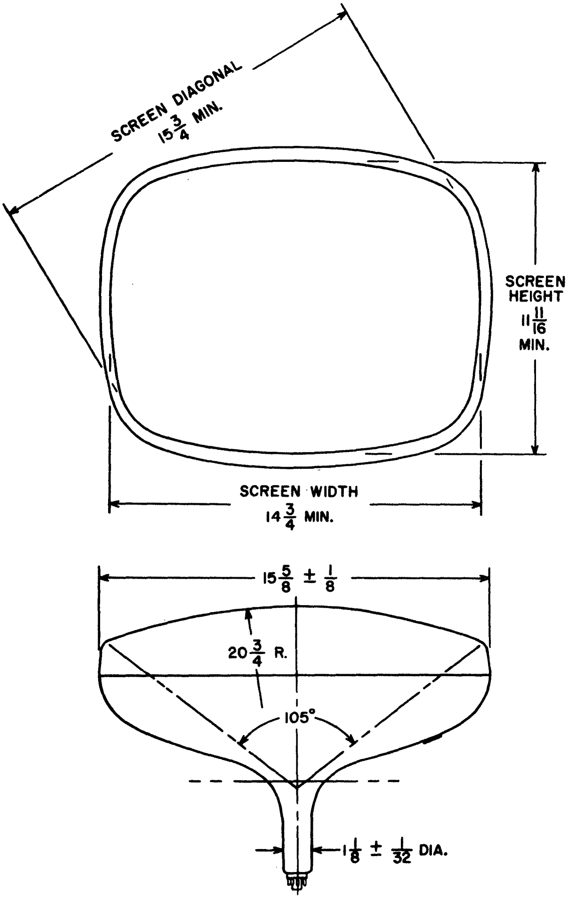
92CL-11517

ALL DIMENSIONS IN INCHES

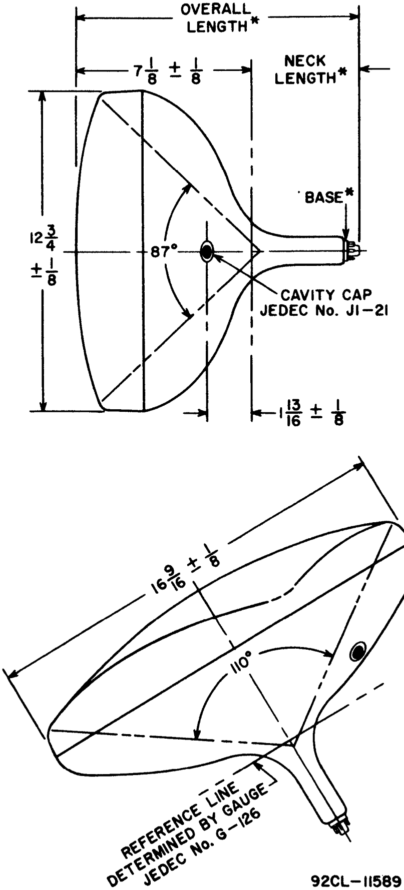
* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J132-1/2 A/B

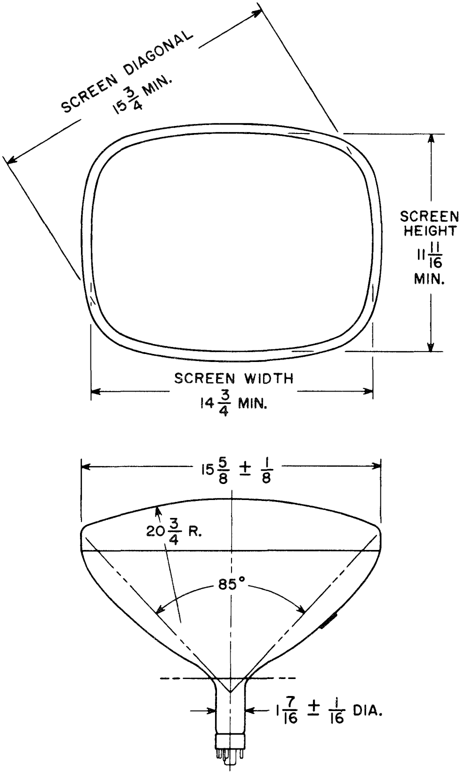


ALL DIMENSIONS IN INCHES

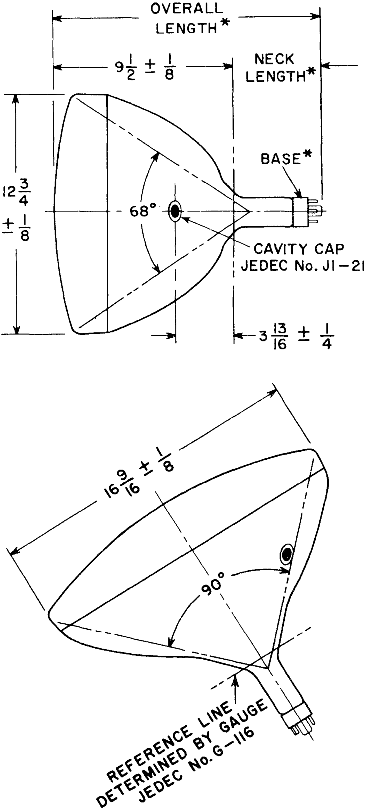
* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J132-1/2 C/D

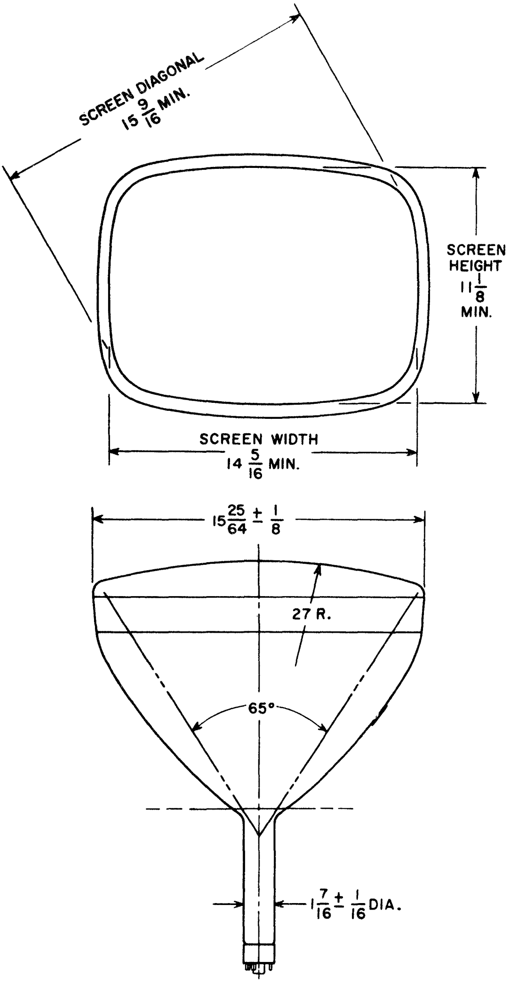


ALL DIMENSIONS IN INCHES

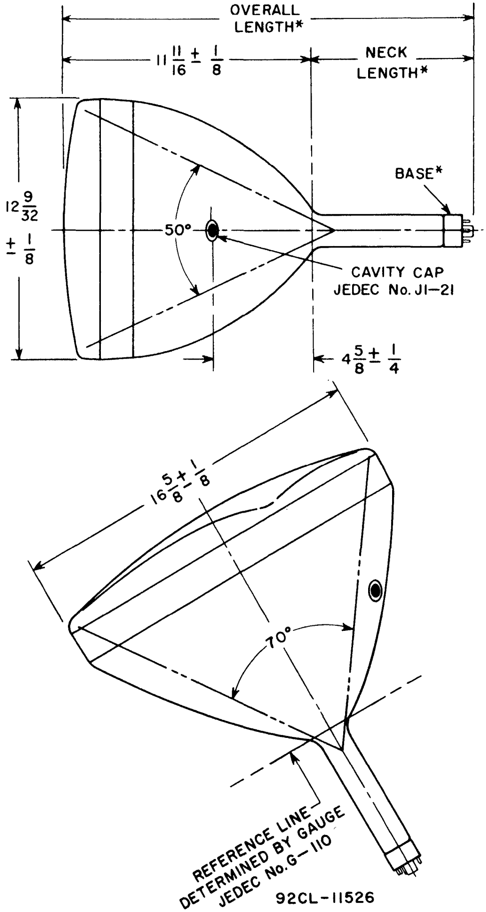
* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J133 B/D

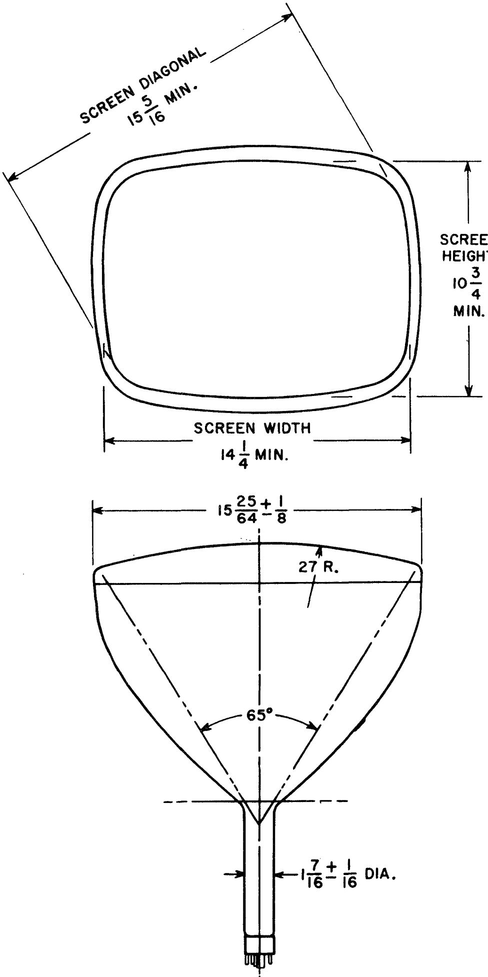


ALL DIMENSIONS IN INCHES

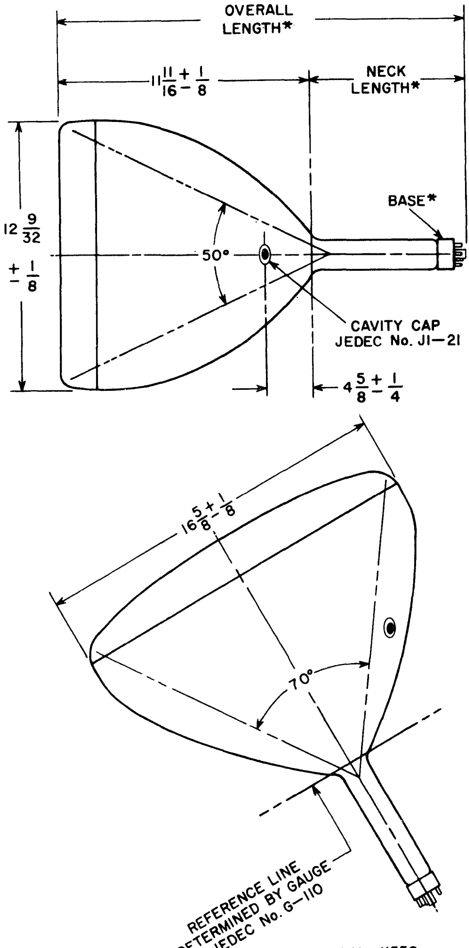
* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J133 C/E

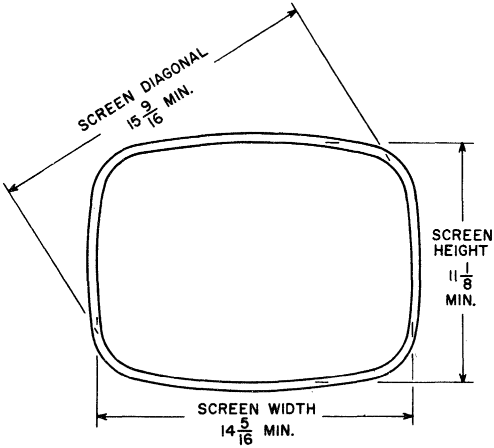


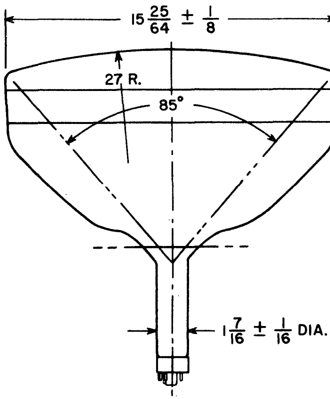
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

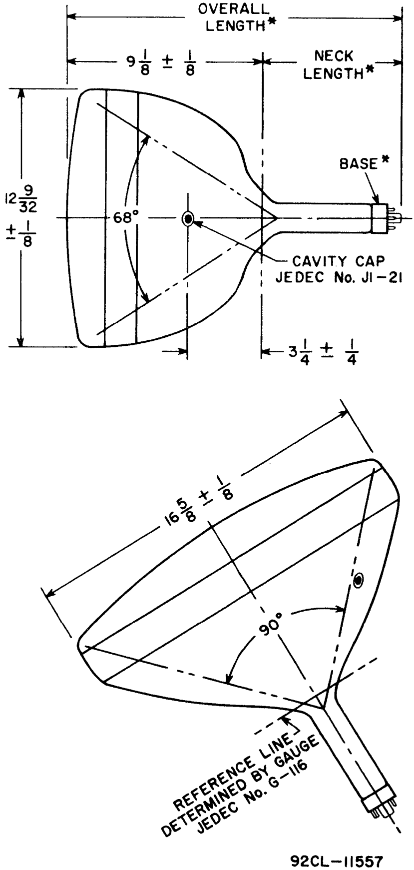
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J133 F/G

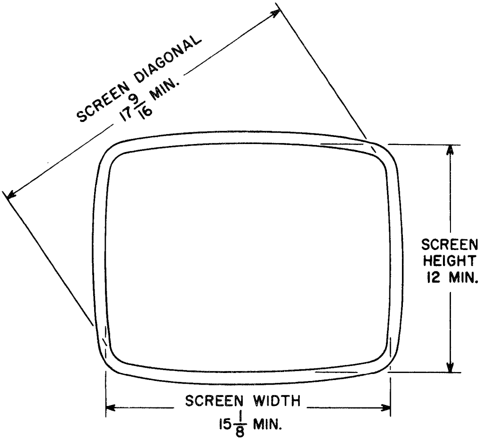


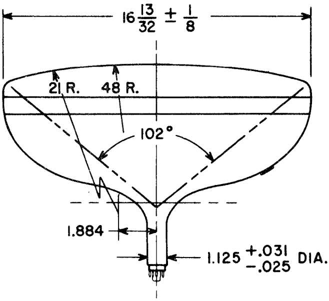
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

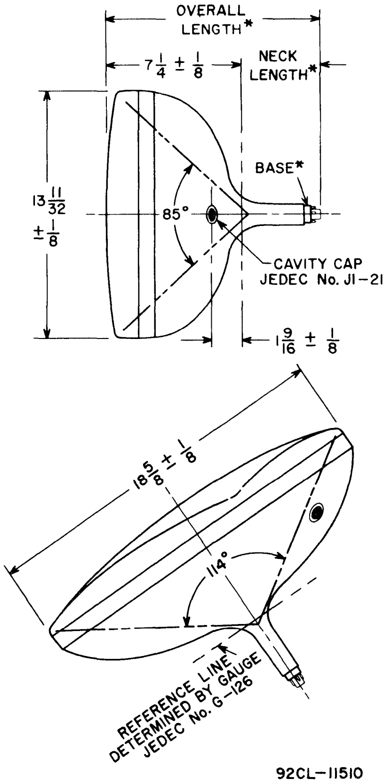
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J149 A

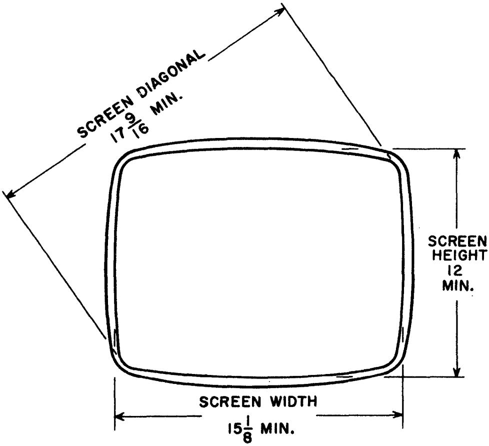


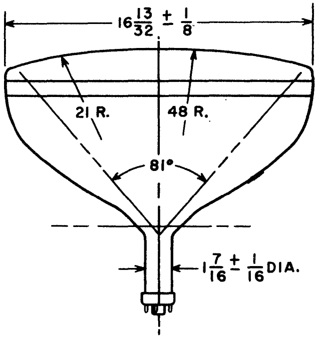
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

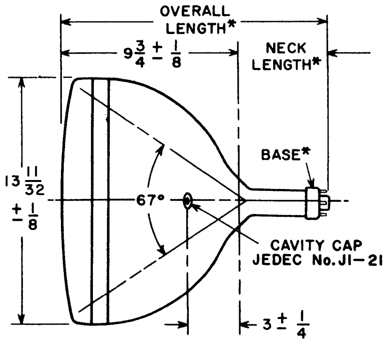
Dimensional Outline

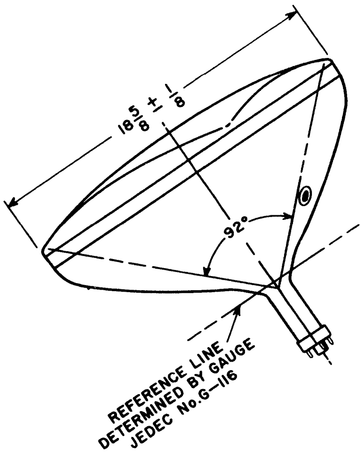
FOR PICTURE TUBES UTILIZING





BULB J149 B





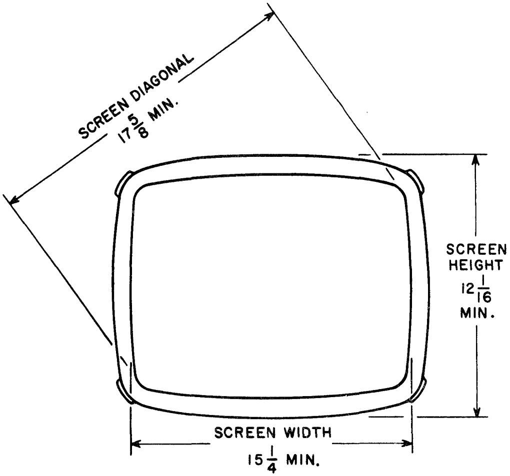
92CL—11604

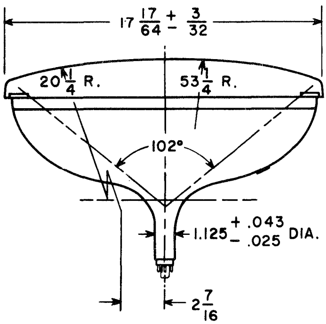
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

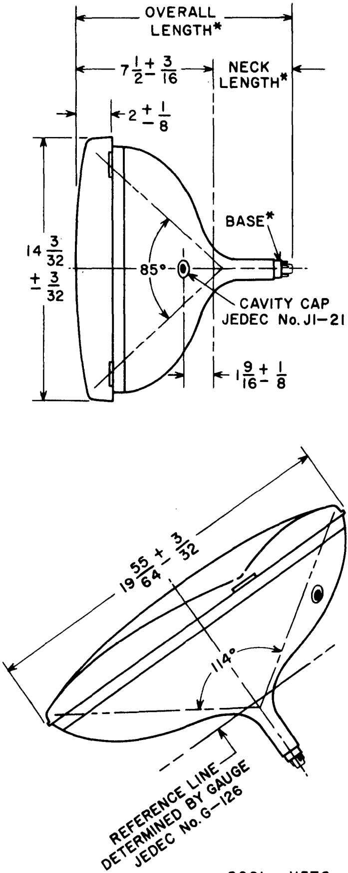
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J149 C AND PROTECTIVE PANEL

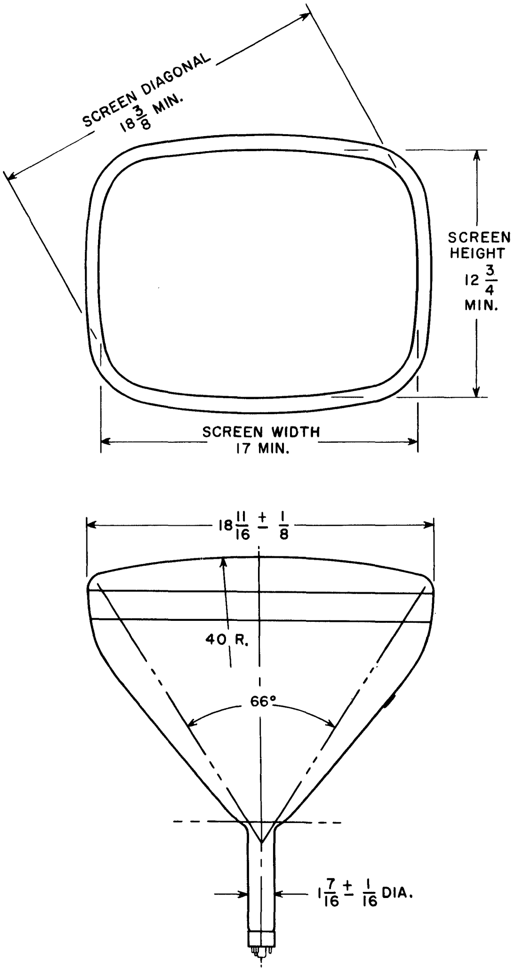


ALL DIMENSIONS IN INCHES

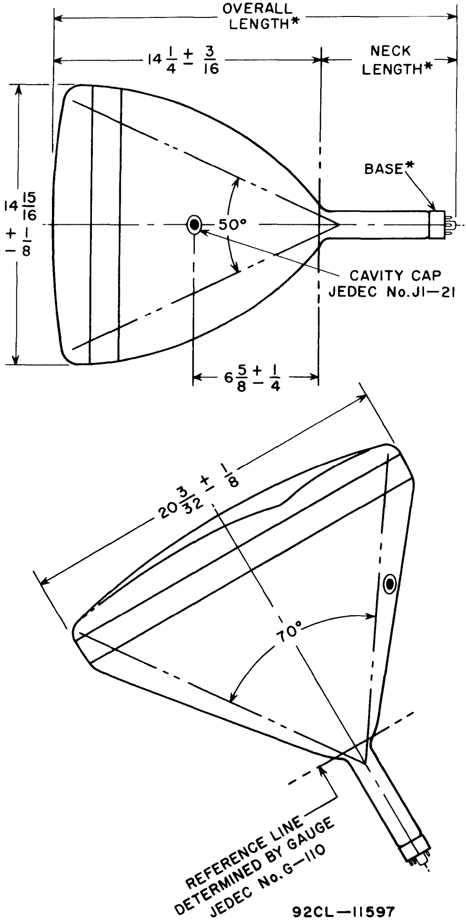
* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J161 C/D



ALL DIMENSIONS IN INCHES

* See data for specific tube type.

Dimensional Outline

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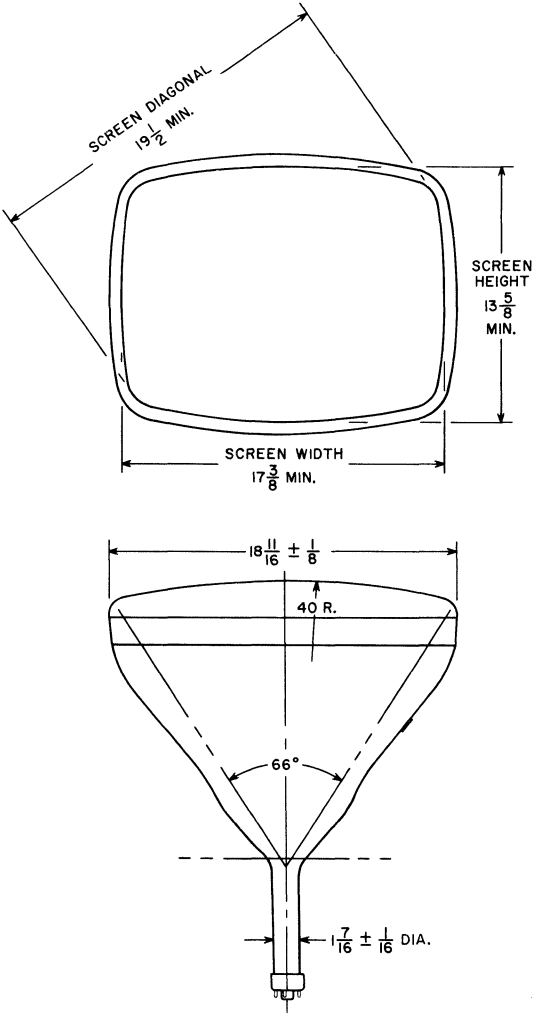
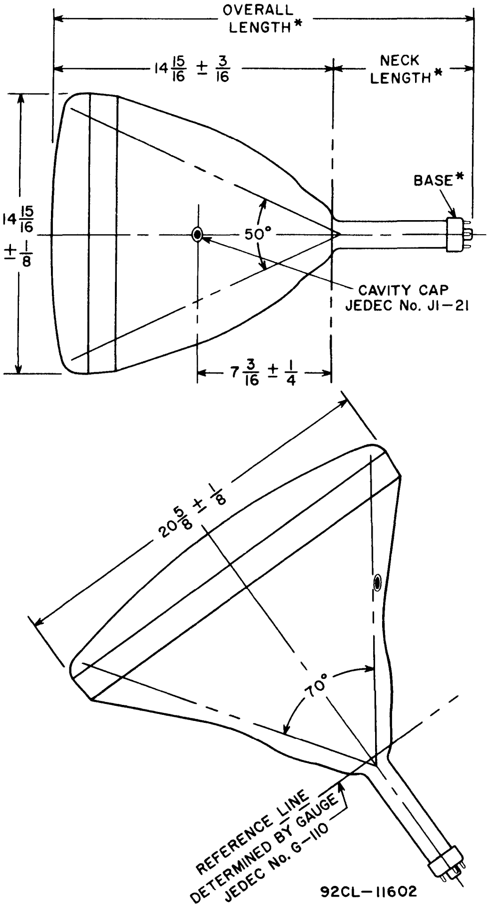


BULB J165 Z

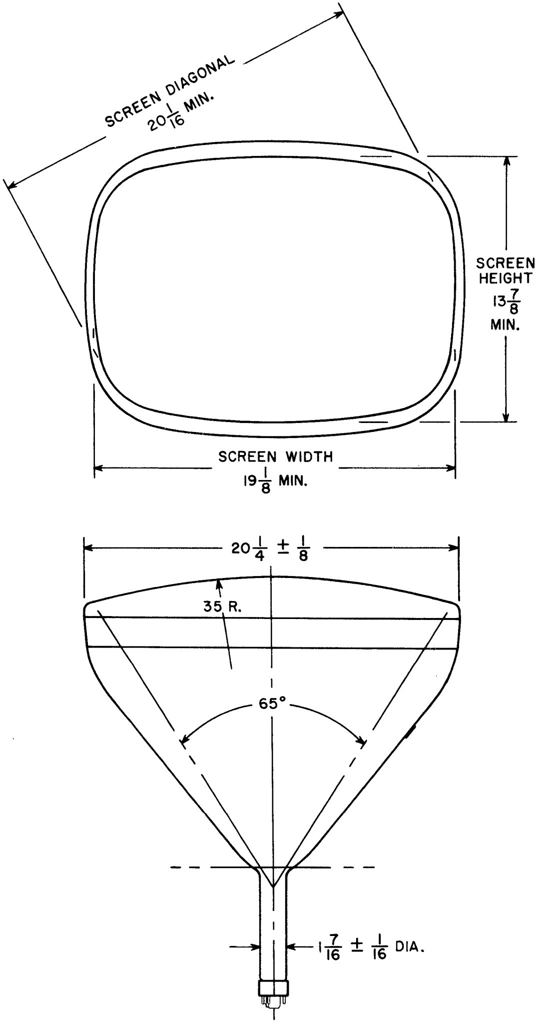


ALL DIMENSIONS IN INCHES

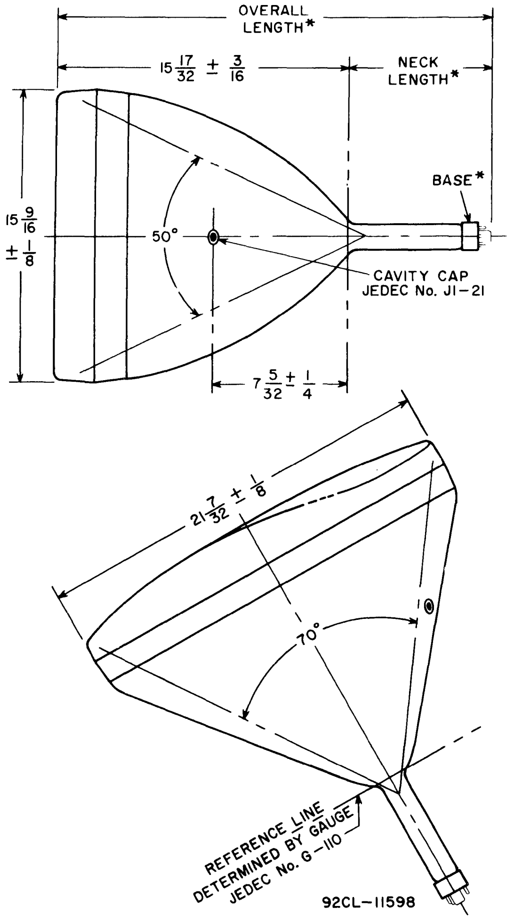
*See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J170 A/C

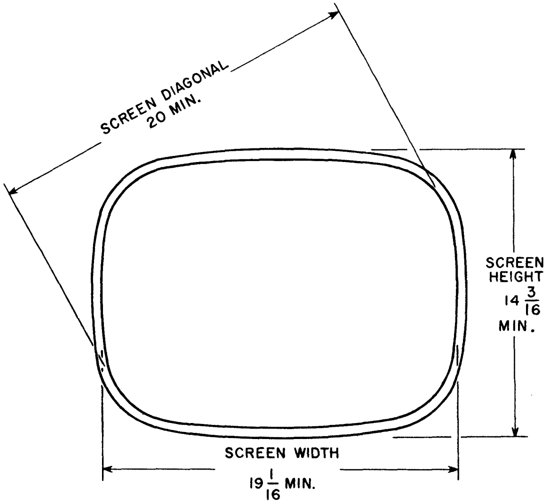


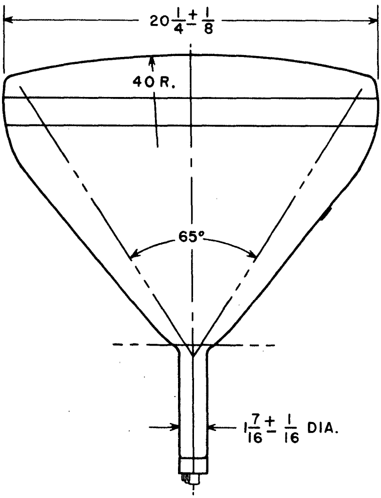
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

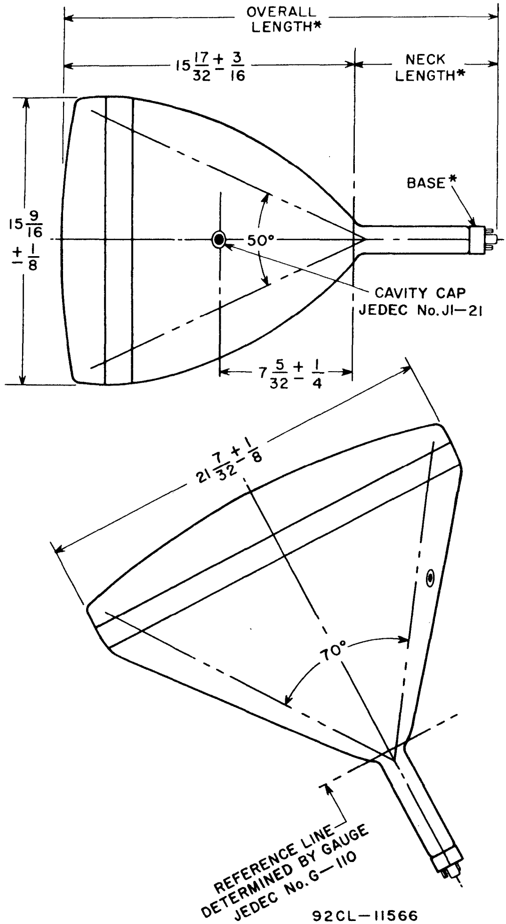
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J170 B/D

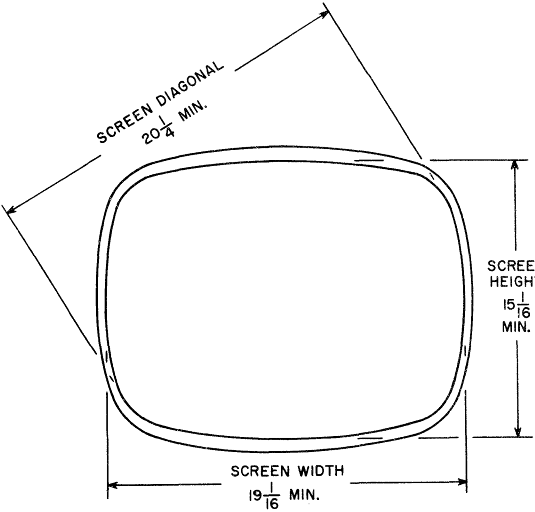


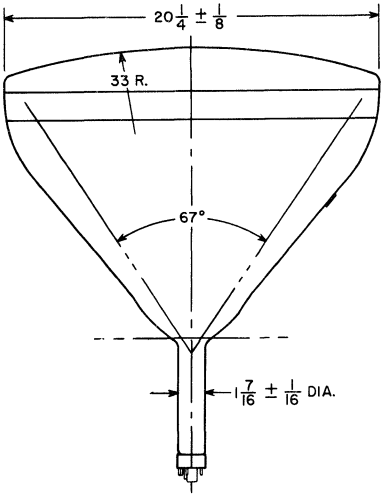
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

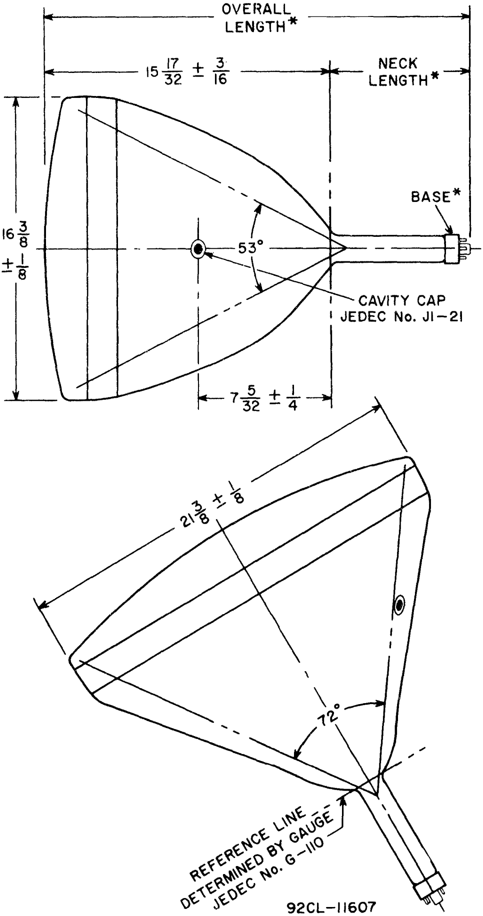
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J171 B/F

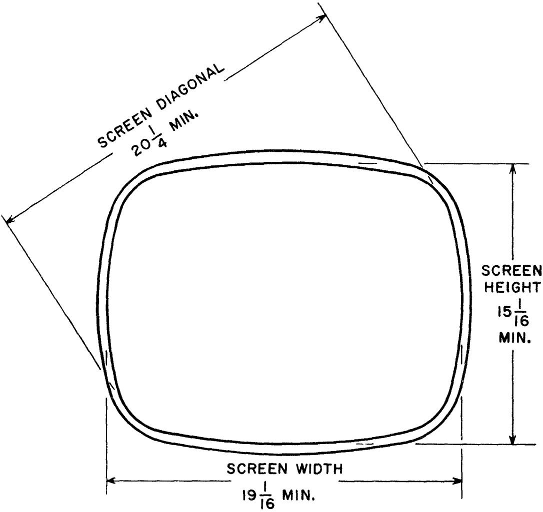


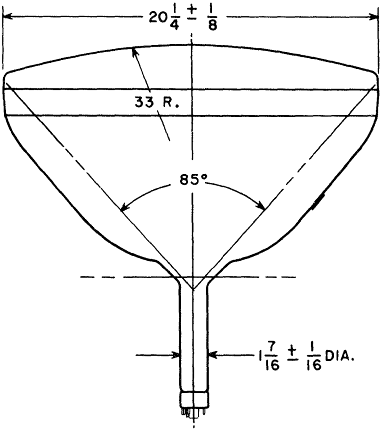
ALL DIMENSIONS IN INCHES

*See data for specific tube type.

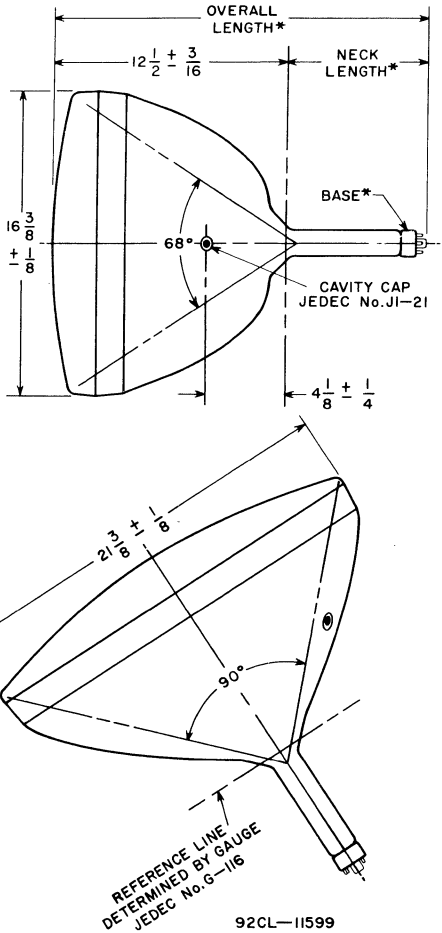
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J171 D/E

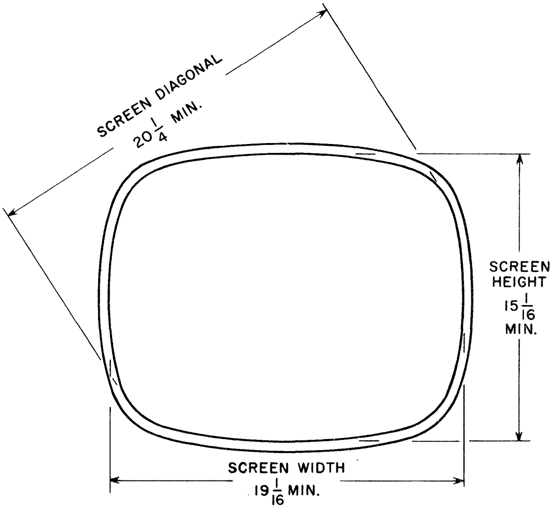


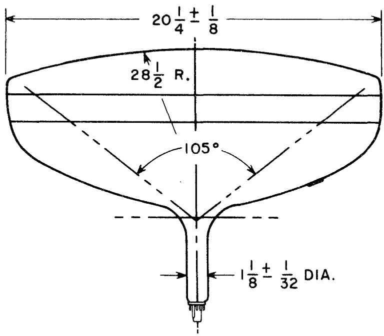
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

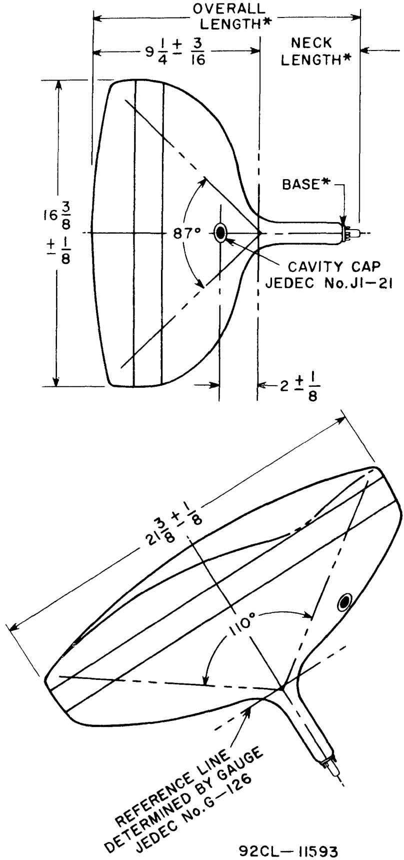
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J171 G/K

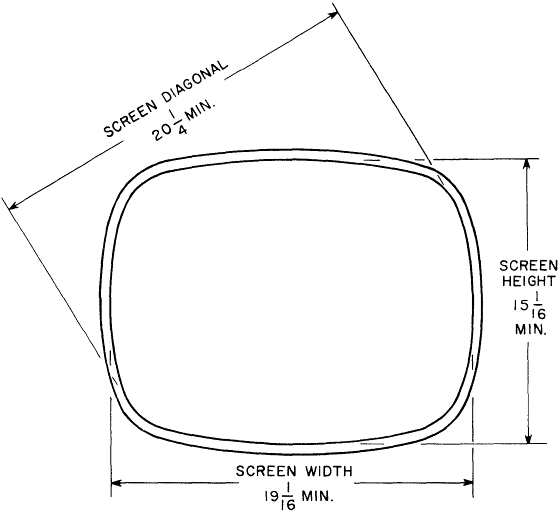


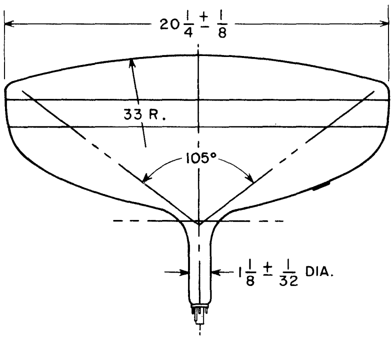
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

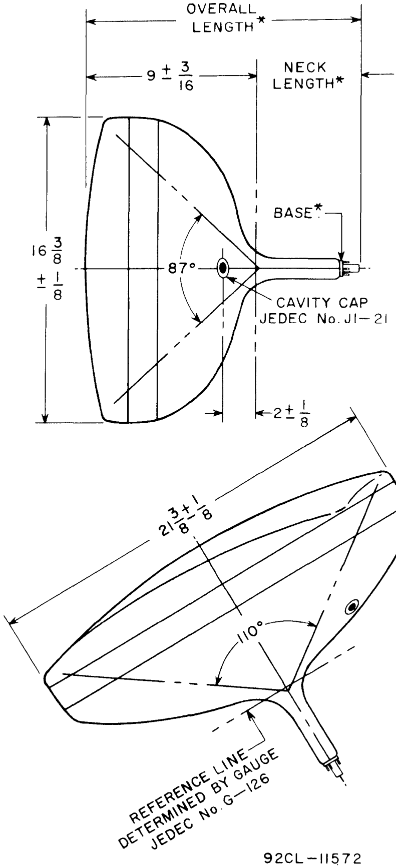
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J171 H/J

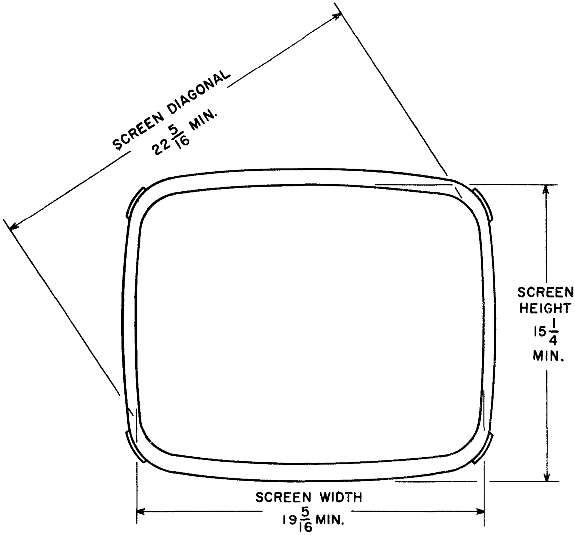


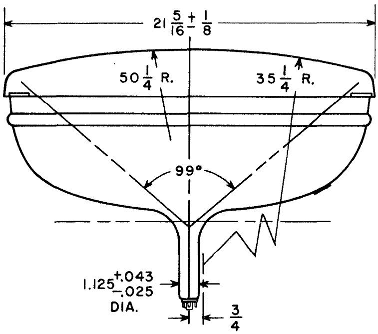
ALL DIMENSIONS IN INCHES

*See data for specific tube type.

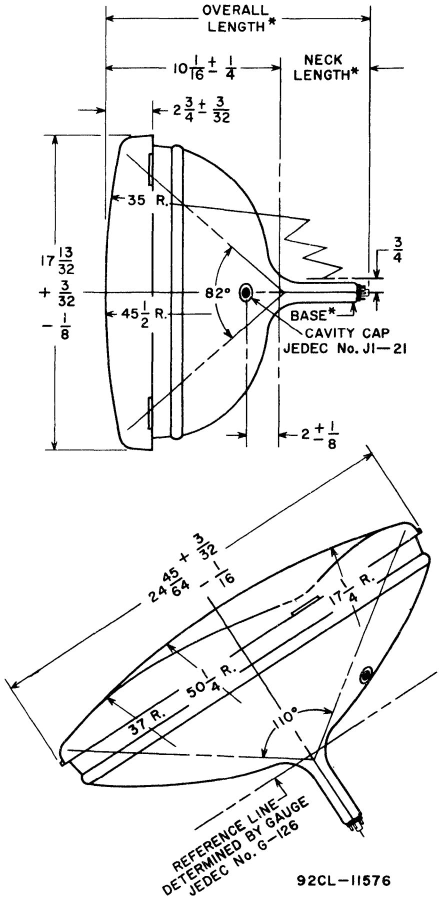
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J187 A AND PROTECTIVE PANEL

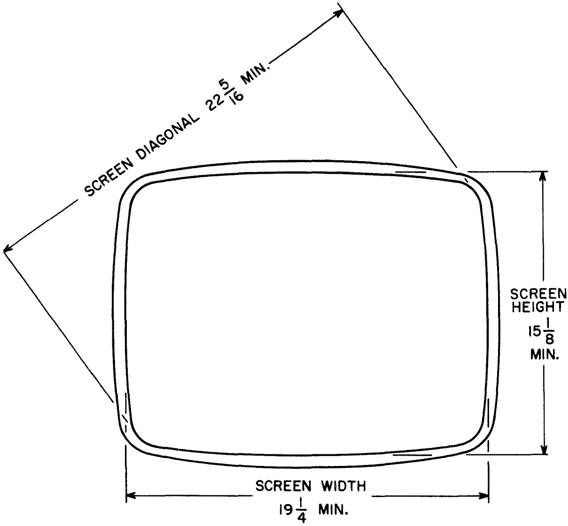


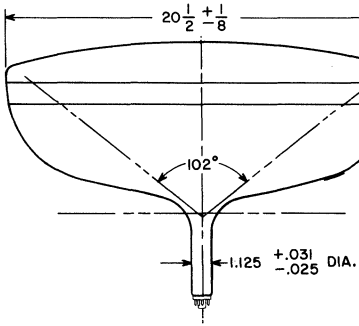
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

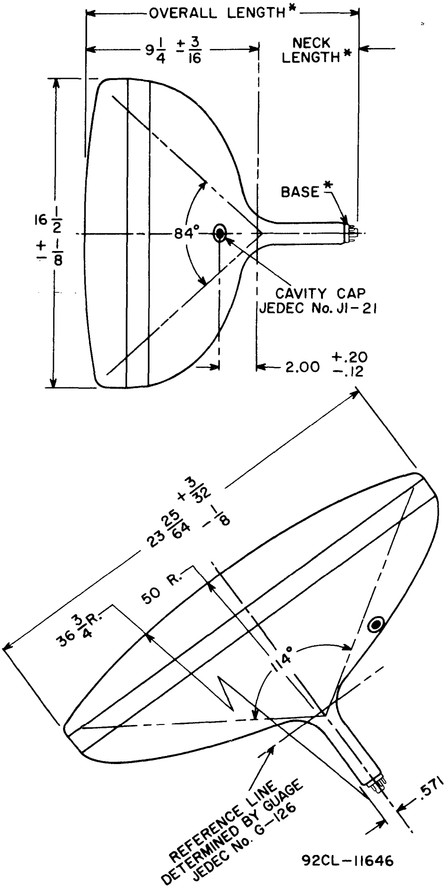
Dimensional Outline

FOR PICTURE TUBES UTILIZING





BULB J187 B

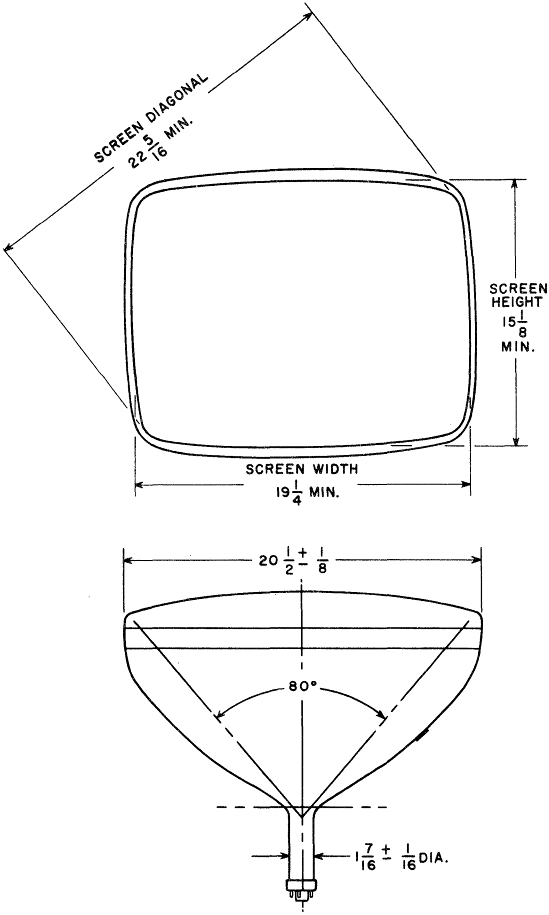


ALL DIMENSIONS IN INCHES

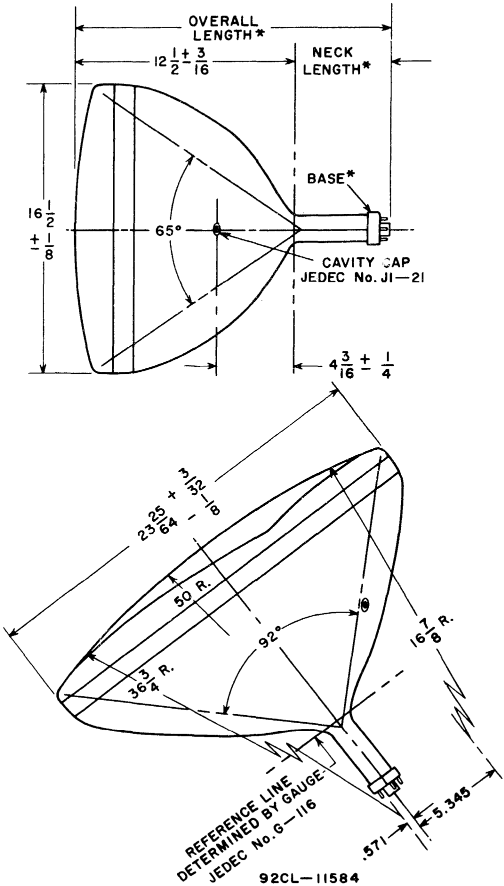
* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J187 C/F

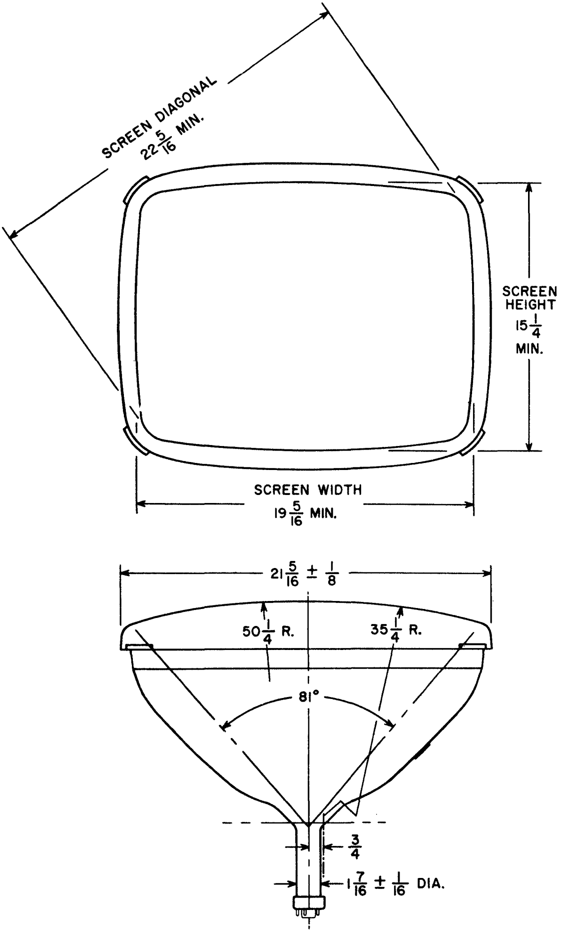


ALL DIMENSIONS IN INCHES

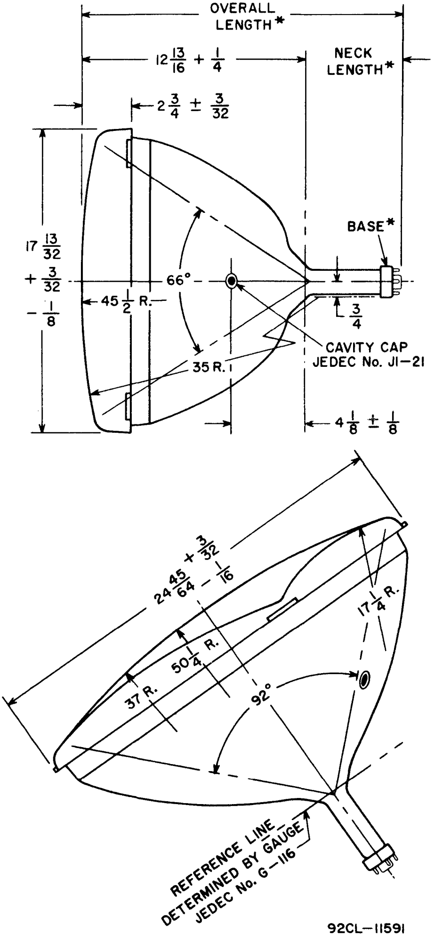
* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J187 D/G AND PROTECTIVE PANEL



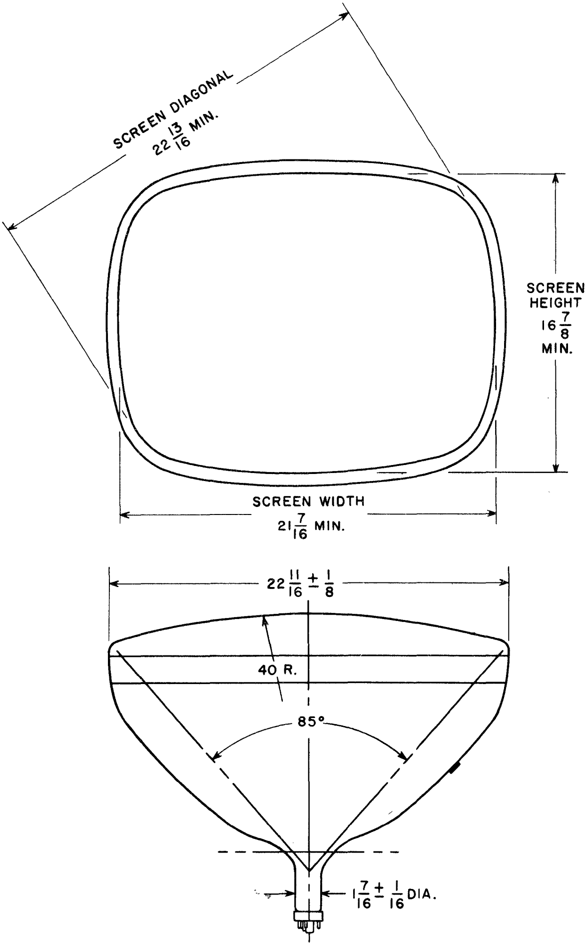
92CL-11591

ALL DIMENSIONS IN INCHES

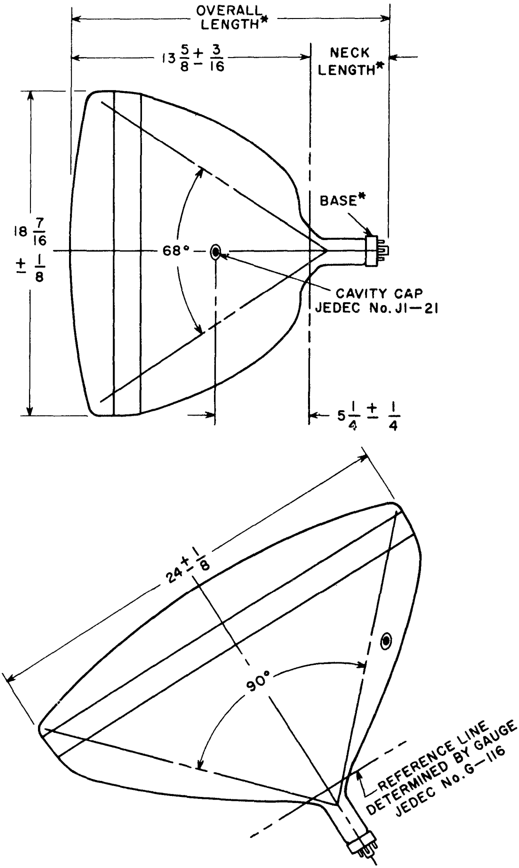
* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J192 A/B

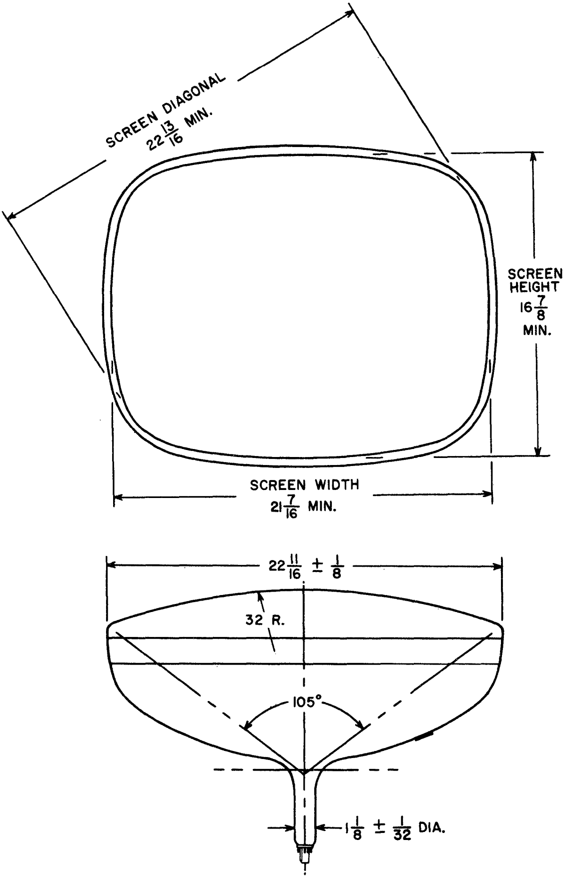


ALL DIMENSIONS IN INCHES

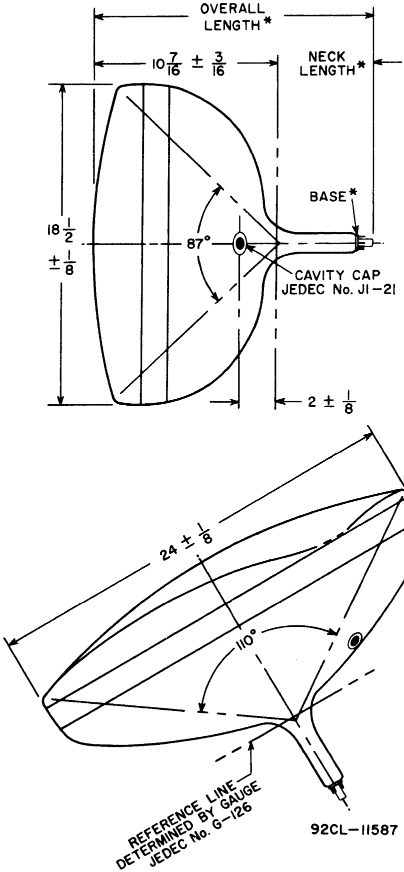
* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J192 C/D

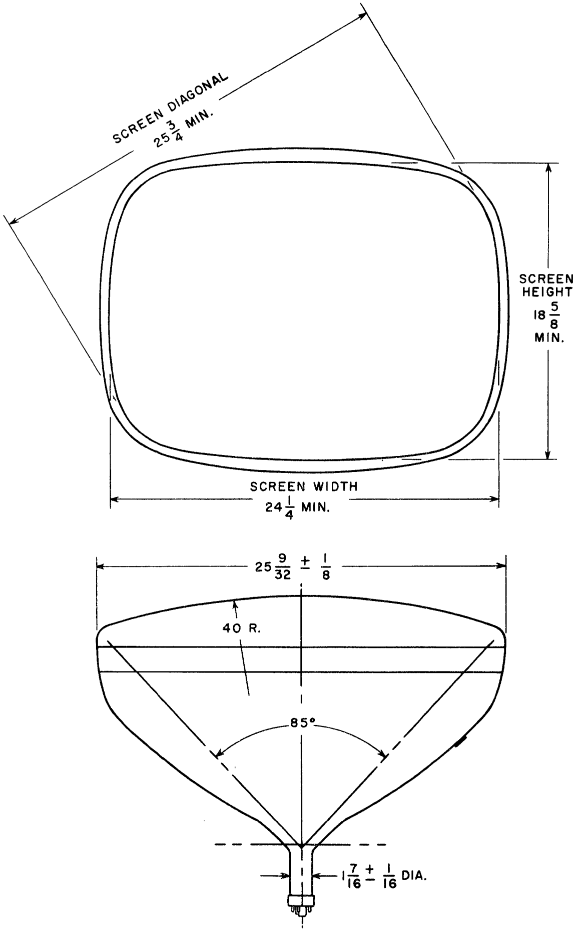


ALL DIMENSIONS IN INCHES

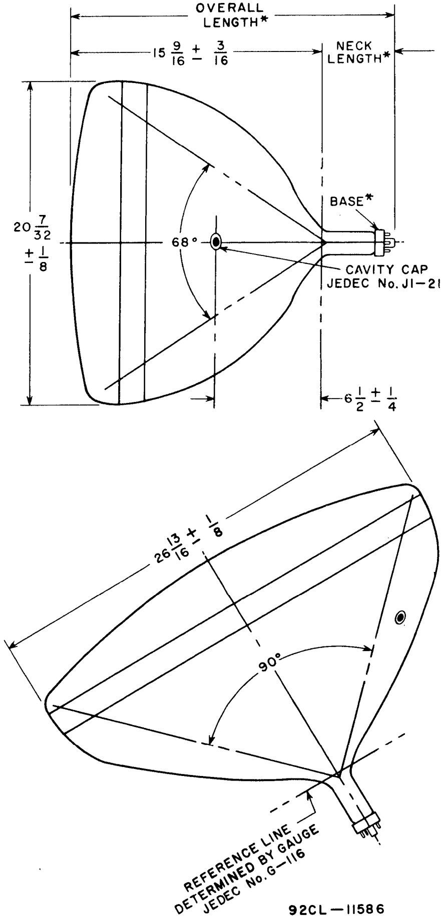
* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



BULB J214-1/2 A

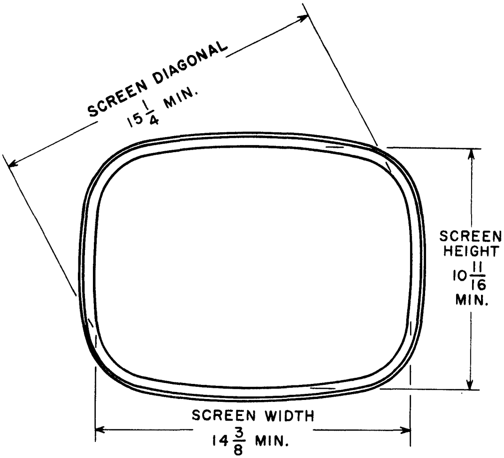


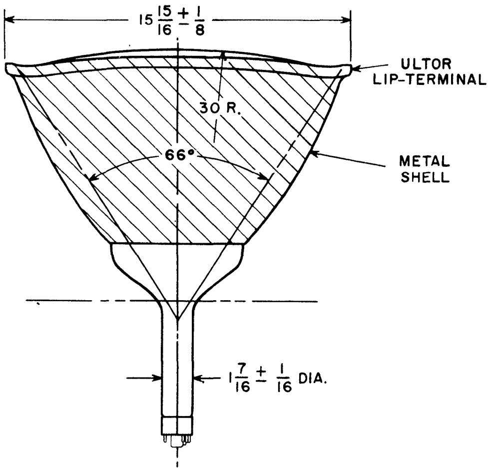
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

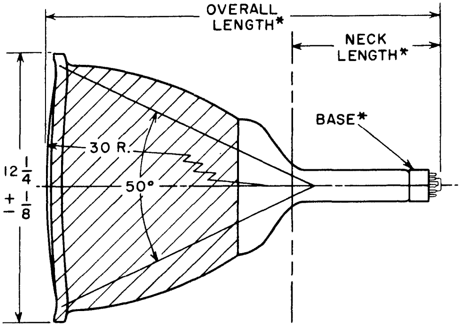
Dimensional Outline

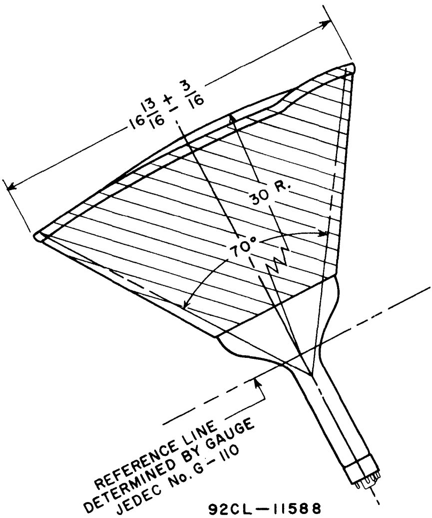
FOR PICTURE TUBES UTILIZING





BULB MJ135 A



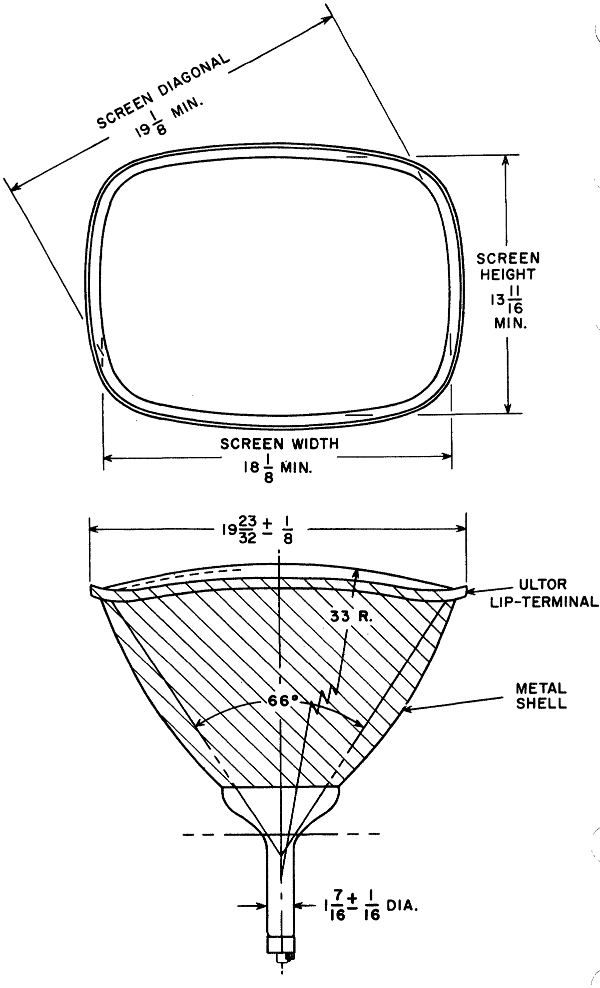


ALL DIMENSIONS IN INCHES

* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING



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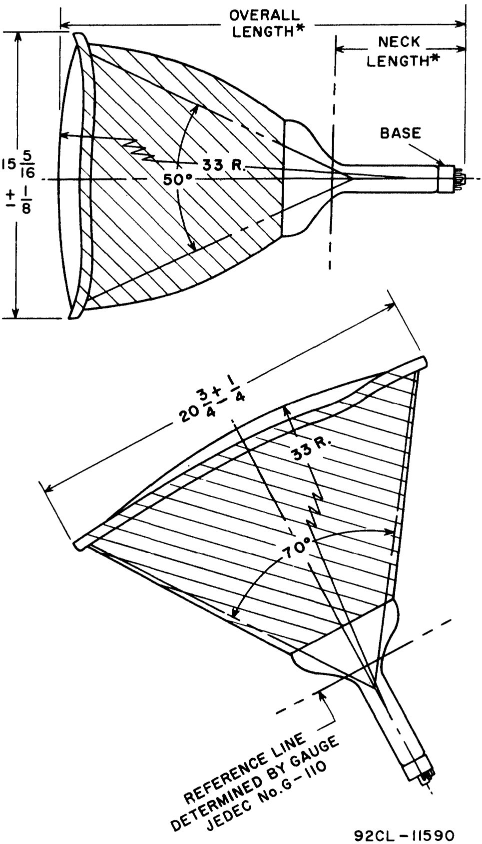
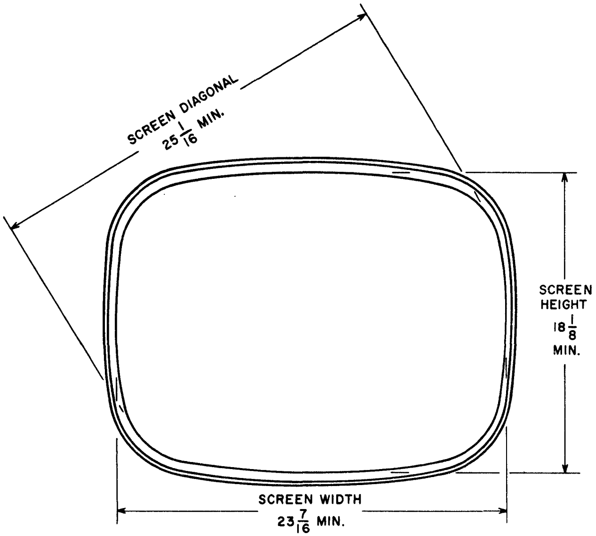


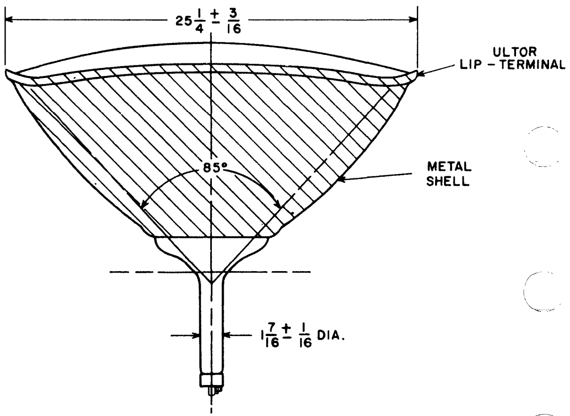
ALL DIMENSIONS IN INCHES

* See data for specific tube type.

Dimensional Outline

FOR PICTURE TUBES UTILIZING





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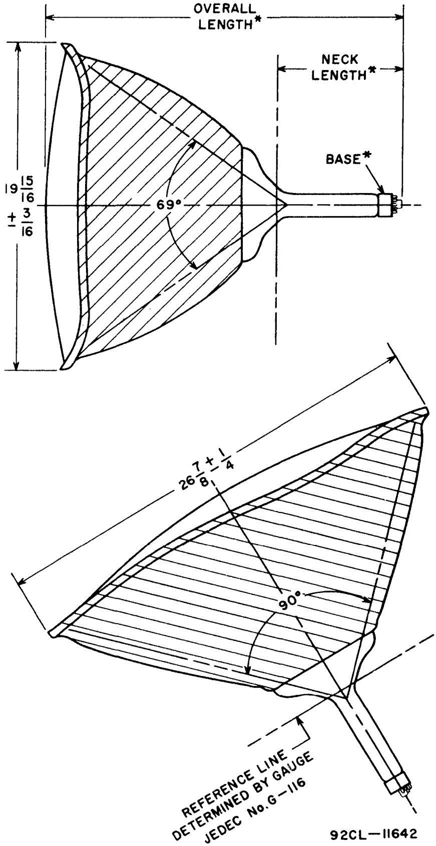
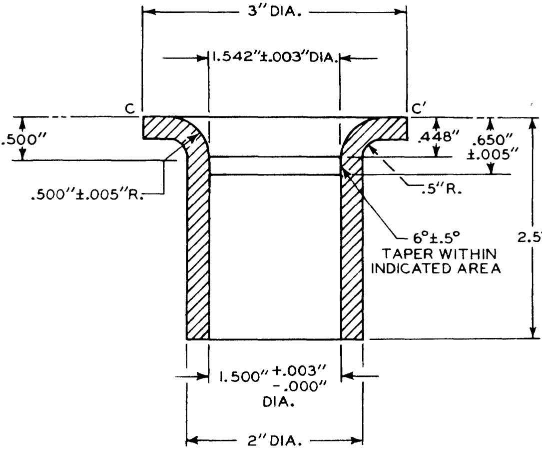


ALL DIMENSIONS IN INCHES

* See data for specific tube type.

REFERENCE-LINE GAUGE
JETEC № G-110

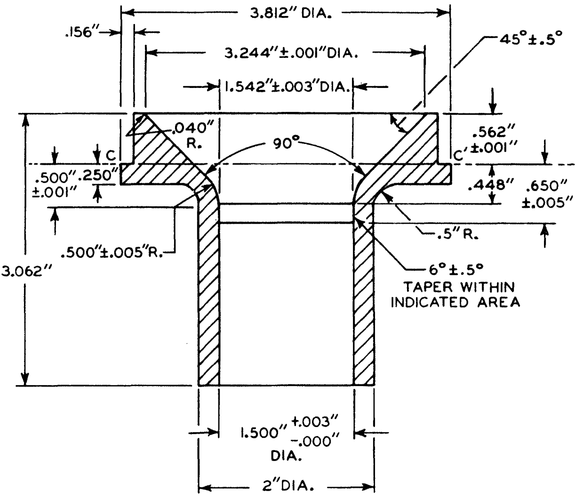


WHEN TUBE NECK IS INSERTED THROUGH GAUGE, REFERENCE LINE WILL BE DETERMINED BY PLANE C-C'WHEN GAUGE IS RESTING ON FUNNEL.

92CS-7391R1

RCA

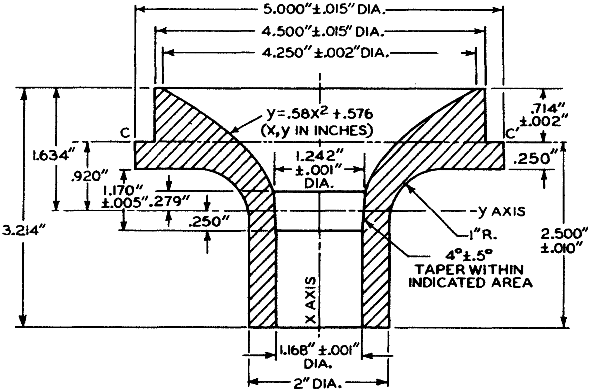
REFERENCE-LINE GAUGE
JETEC № G-116



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

92CS-7896R1

REFERENCE-LINE GAUGE
JETEC № G-126



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

"y" VALUES MUST BE HELD TO ±.002."

92CS-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.

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.

1EP1
OSCILLOGRAPH TUBE

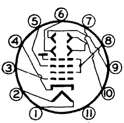
ELECTROSTATIC FOCUS — ELECTROSTATIC DEFLECTION

DATA

General:

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

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



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

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

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1EP1

1EP1

OSCILLOGRAPH TUBE

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

The angle between the trace produced by DJ_3 and DJ_4 and its intersection with the plane through the tube axis and the midpoint between pins 9 and 10 does not exceed $\pm 10^{\circ}$.

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_{c_4}) between recommended minimum and 1500 volts*

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

Examples of Use of Design Ranges:

For ultor voltage of	*500*	*1000*	*volts*
Grid-No.3 Voltage for Focus	50 to 150	100 to 300	volts

* Brilliance and definition decrease with decreasing ultor voltage. Recommended minimum for the 1EP1 in general service is 500 volts, but a value as low as 300 volts may be used under conditions of low-velocity deflection and low ambient light levels. For operation between 300 and 500 volts, it is essential that the ultor voltage be applied before beam-current flow. Otherwise, a screen charge may develop to block off or distort the scanning pattern.

##: See next page.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

IEPI

IEPI

OSCILLOGRAPH TUBE

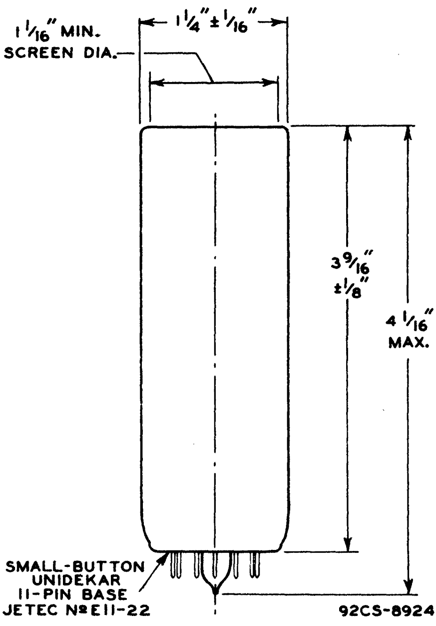
For ultor voltage of	*500*	*1000*	*volts*
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-7 to -21	-14 to -42	volts
Deflection Factors:			
DJ_1 & DJ_2.	105 to 155	210 to 310	volts dc/in.
DJ_3 & DJ_4.	120 to 175	240 to 350	volts dc/in.

Maximum Circuit Values:

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

The center of the undeflected focused spot will fall within a circle having 2.5-mm radius concentric with the center of the tube face.

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



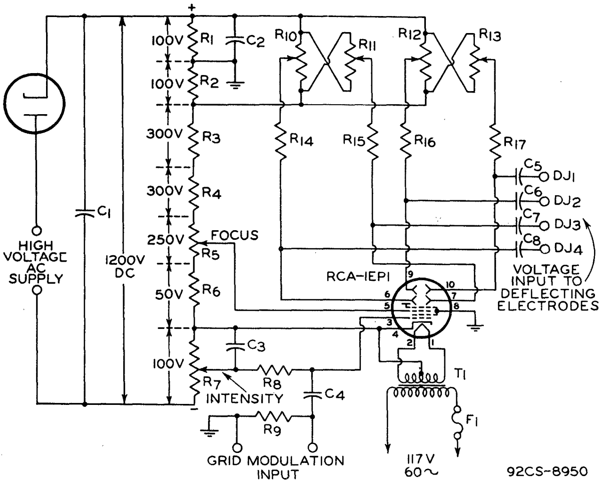
TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1EP1

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



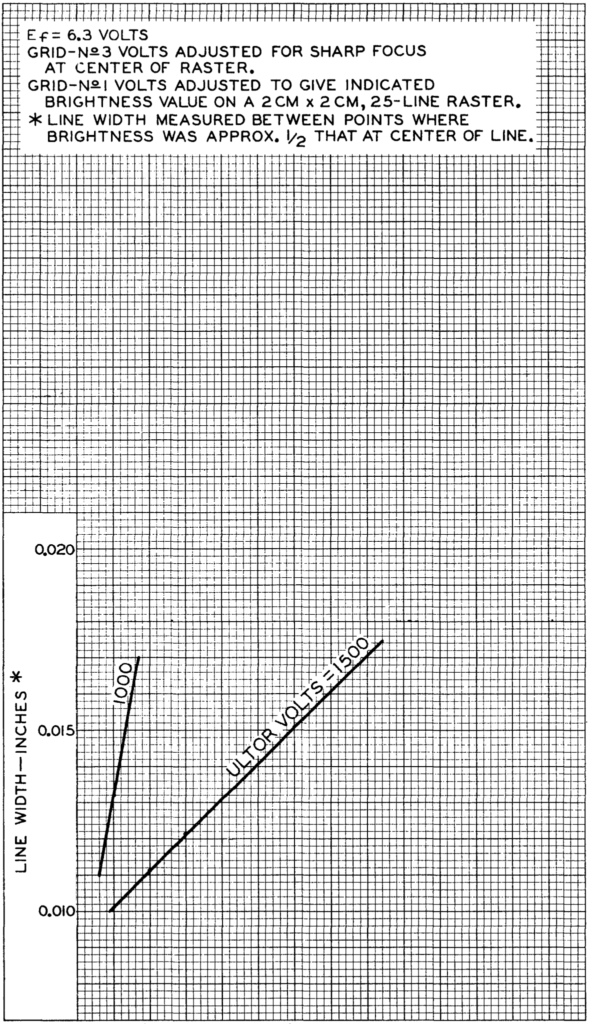
C1: 0.5 μf, 2000 volts
C2: 1 μf, 200 volts
C3: 1 μf, 200 volts
C4: 0.05 μf, 1600 volts
C5 C6 C7 C8: 0.05 μf, 600 volts
R1 R2: 510,000 ohms, 1/2 watt
R3 R4: 300,000 ohms, 1 watt
R5: 250,000-ohms, 2-watt potentiometer
R6: 51,000 ohms, 1/2 watt
R7: 100,000-ohms, 1/2-watt potentiometer
R8: 510,000 ohms, 1/2 watt
R9: 5 megohms, 1/2 watt
R10 R11: Dual 1-megohm potentiometer
R12 R13: Dual 1-megohm potentiometer
R14 R15 R16 R17: 1.5 megohms, 1/2 watt
T1: Transformer, 6.3 volts at 1 ampere, insulated for 2000 volts, such as Thordarson T21F08
F1: 1-ampere fuse

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

IEPI

IEPI

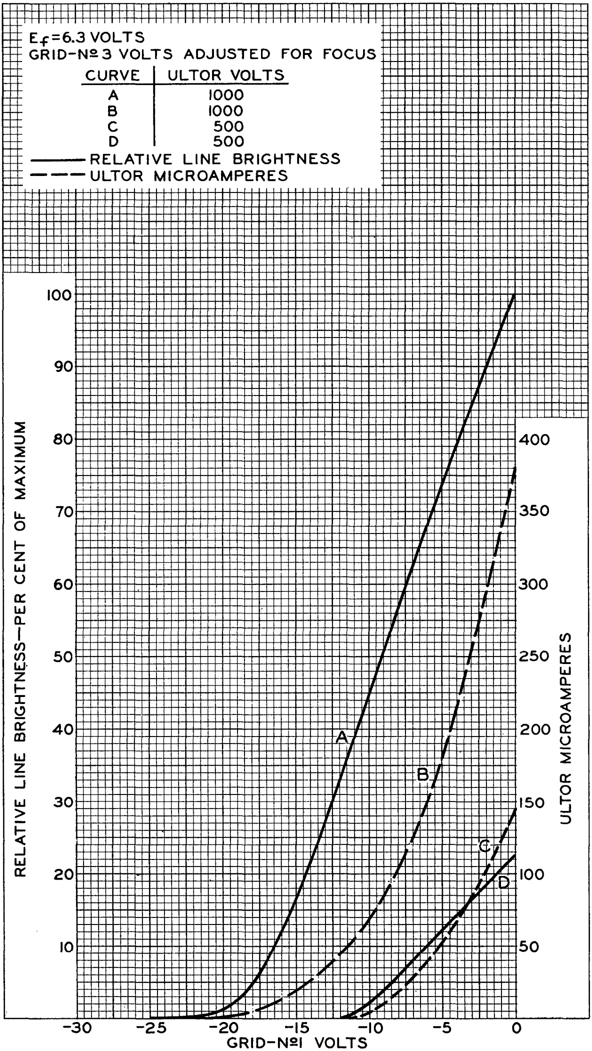
AVERAGE CHARACTERISTICS



IEPI

IEPI

AVERAGE CHARACTERISTICS



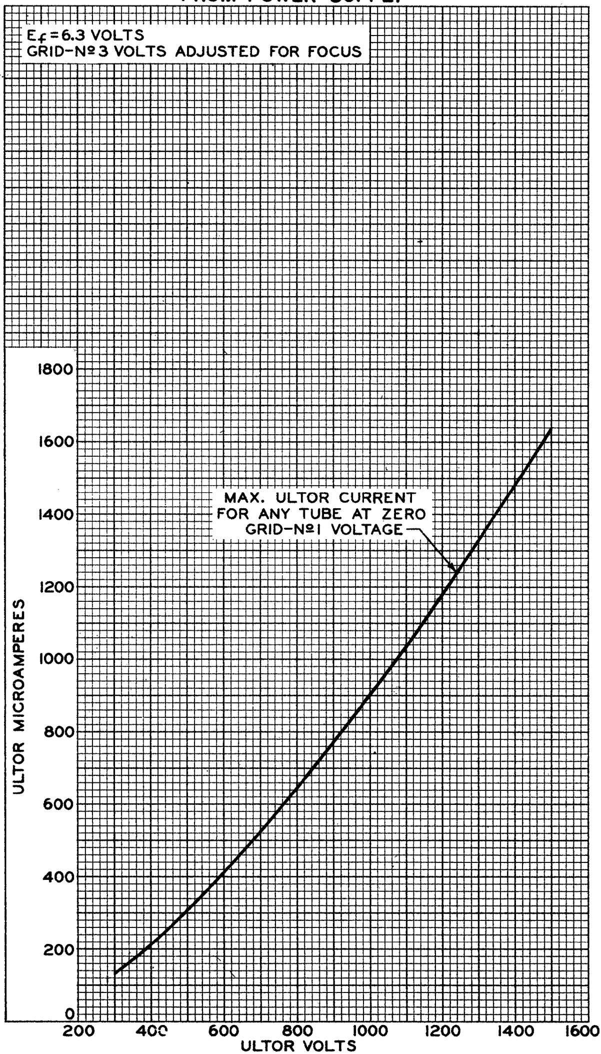
TUBE DIVISION 92CM-8938

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

IEPI

IEPI

MAXIMUM ULTOR-CURRENT REQUIREMENTS
FROM POWER SUPPLY



RCA

IEP2

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

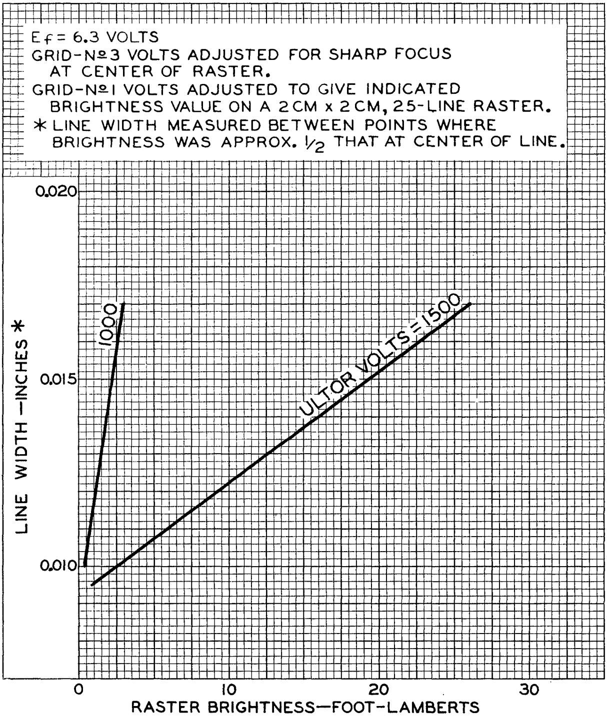
The 1EP2 is the same as the 1EP1 except for the following items:

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.

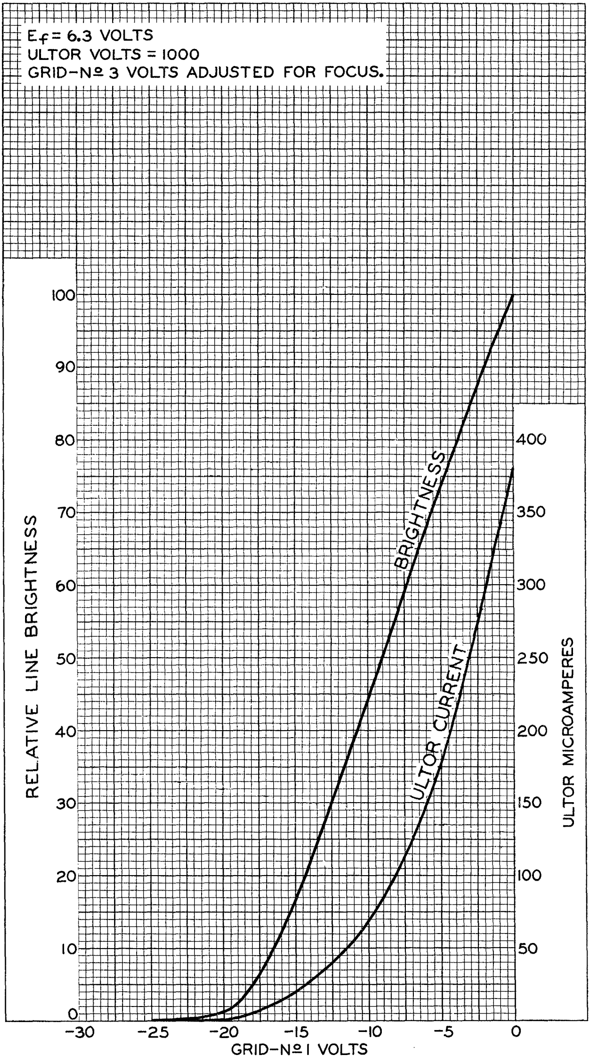
AVERAGE CHARACTERISTICS



IEP2

IEP2

AVERAGE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9298

1EP11

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

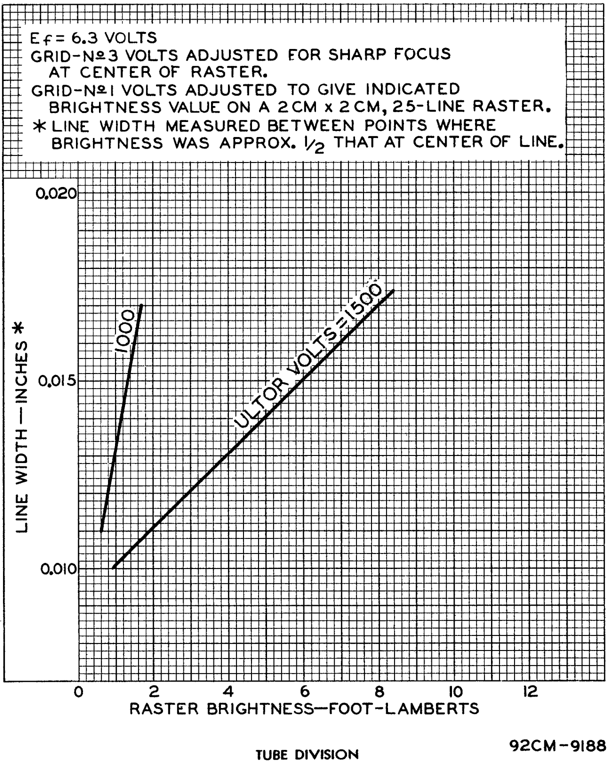
The 1EP11 is the same as the 1EP1 except for the following items:

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

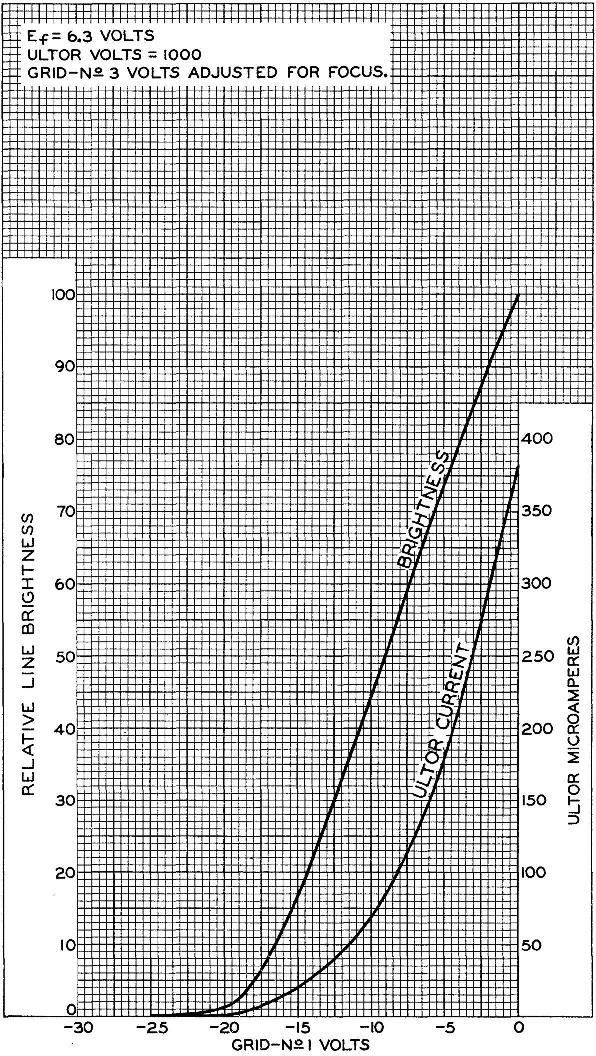


IEP11

RCA

IEP11

AVERAGE CHARACTERISTICS



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9298

2API-A

2API-A

HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 2AP1

General:

Heater, for Unipotential Cathode:

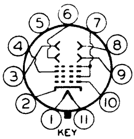
Voltage	6.3 ± 10%	ac or dc volts
Current	0.6	amp.

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes	8.0	μμf
Cathode to All Other Electrodes	5.5	μμf
DJ_1 to DJ_2	0.6	μμf
DJ_3 to DJ_4	1.1	μμf
DJ_1 to All Other Electrodes	8.5	μμf
DJ_3 to All Other Electrodes	9.0	μμf
DJ_1 to All Other Electrodes except DJ_2	8.0	μμf
DJ_2 to All Other Electrodes except DJ_1	4.6	μμf
DJ_3 to All Other Electrodes except DJ_4	7.5	μμf
DJ_4 to All Other Electrodes except DJ_3	6.0	μμf

Phosphor (For Curves, see front of this Section)	No.1
Fluorescence	Green
Persistence	Medium
Focusing 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
Basing Designation for BOTTOM VIEW	11L

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



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

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

With DJ_1 positive with respect to DJ_2, the spot is deflected toward pin 4. With DJ_3 positive with respect to DJ_4, the spot is deflected toward pin 1.

The angle between the trace produced by DJ_3 and DJ_4 and its intersection with the plane through the tube axis and pin 1 does not exceed 10°.

The angle between the trace produced by DJ_3 and DJ_4 and the trace produced by DJ_1 and DJ_2 is 90° ± 4°.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

2AP1-A

HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

Maximum Ratings, ***Absolute Values*:**

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

Typical Operation:

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

★ Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 500 volts.

● Individual tubes may require between +20% and −45% of the values shown with grid-No.1 voltages between zero and cutoff.

Visual extinction of stationary focused spot. Supply should be adjustable to ± 50% of these values.

▲ See curve for average values.

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

Spot Position:

The undeflected focused spot will fall within a 10-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ_1 and DJ_2. Suitable test conditions are: anode-No.2 voltage, 1000 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 megohm each, connected to anode No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

Maximum Circuit Values:

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

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

2AP1-A

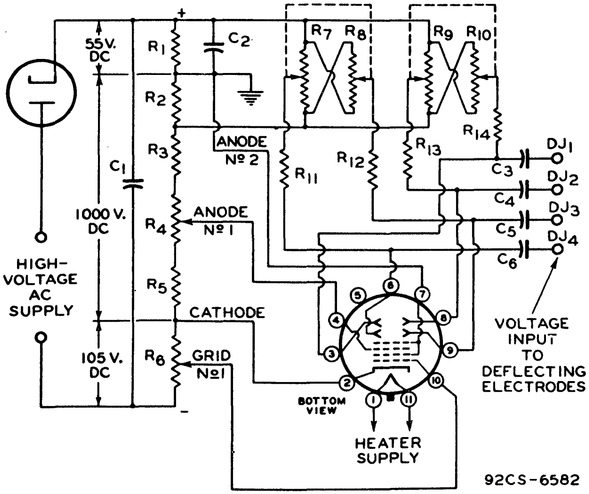
HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

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

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

TYPICAL OSCILLOGRAPH CIRCUIT



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

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

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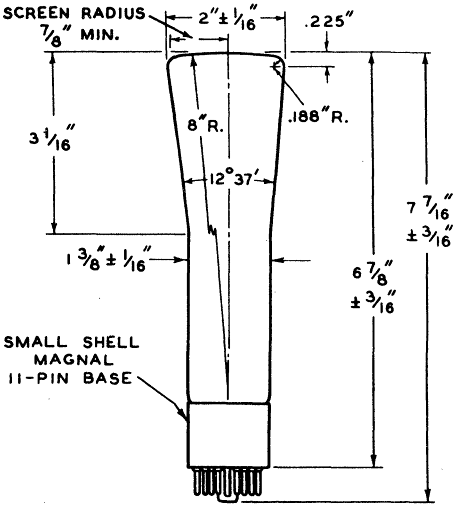
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

2AP1-A

2AP1-A

HIGH-VACUUM CATHODE-RAY TUBE



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

RCA

2BP1

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

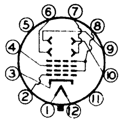
Voltage	6.3	ac or dc volts
Current	0.6	amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes	8	$\mu\mu f$
DJ_1 to DJ_2	2	$\mu\mu f$
DJ_3 to DJ_4	2	$\mu\mu f$
DJ_1 to All Other Electrodes	11	$\mu\mu f$
DJ_2 to All Other Electrodes	8	$\mu\mu f$
DJ_3 to All Other Electrodes	7	$\mu\mu f$
DJ_4 to All Other Electrodes	8	$\mu\mu f$ ←

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" ± 3/16"
Greatest Diameter of Bulb	2" ± 1/16"
Minimum Useful Screen Diameter	1-3/4"
Mounting Position	Any
Base	Small-Shell Duodecal 12-Pin
Basing Designation for BOTTOM VIEW	12E

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



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

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

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

The plane through the tube axis and pin No.4 may vary from the trace produced by DJ1 and DJ2 by an angular tolerance (measured about the tube axis) of 10°.

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

← Indicates a change.

2BP1

RCA

2BP1

OSCILLOGRAPH TUBE

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

ANODE-No.2● VOLTAGE	2500 max.	volts
ANODE-No.1 VOLTAGE	1000 max.	volts
→ GRID-No.1 VOLTAGE:		
Negative bias value	200 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

Equipment Design Ranges:

For any anode-No.2 voltage (E_{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:

For anode-No.2 voltage of	*1000*	*2000*	*volts*
Anode-No.1 Voltage	150 - 280	300 - 560	volts
Max. Grid-No.1 Voltage for Visual Cutoff	-67.5	-135	volts
Deflection Factors:			
DJ_1 & DJ_2	115 - 155	230 - 310	volts dc/in.
DJ_3 & DJ_4	74 - 100	148 - 200	volts dc/in.

Maximum Circuit Values:

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

* Brilliance and definition decrease with decreasing anode-No.2 voltage. A value as low as 500 volts is recommended only for low-velocity deflection and low room-light levels.

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

● Anode No.2 and grid No.2 which are connected together within tube, are referred to herein as anode No.2. The product of anode-No.2 voltage and average anode-No.2 current should be limited to 6 watts.

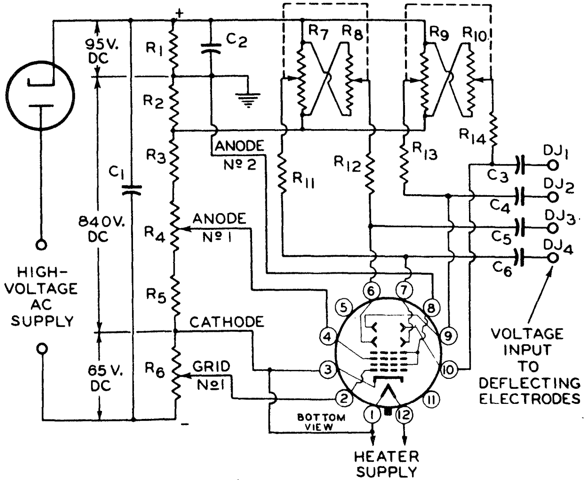
□ The center of the undeflected, focused spot will fall within a circle having a 5.0-mm radius concentric with the center of the tube face.

→ Indicates a change.

RCA

2BP1
OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



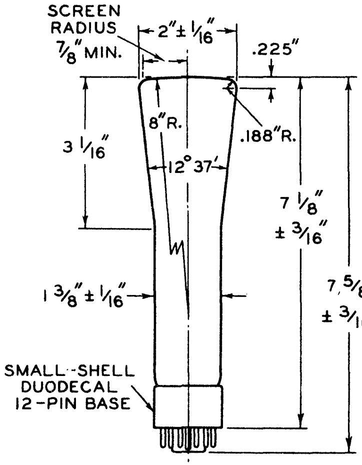
92CM-6777R1

C1: 0.2 μf
C2: 1.0 μf
C3 C4 C5 C6: 0.05-μf Blocking Capacitors*
R1 R2: 2.5 Megohms, 0.5 Watt
R3: 2.5 Megohms, 1 Watt
R4: 1.0-Megohm Potentiometer
R5: 0.5 Megohm, 0.5 Watt
R6: 0.35 Megohm, 0.5 Watt
R7 R8: Dual 5-Megohm Potentiometer
R9 R10: Dual 5-Megohm Potentiometer
R11 R12 R13 R14: 2 Megohms, 0.5 Watt

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

2BP1

OSCILLOGRAPH TUBE



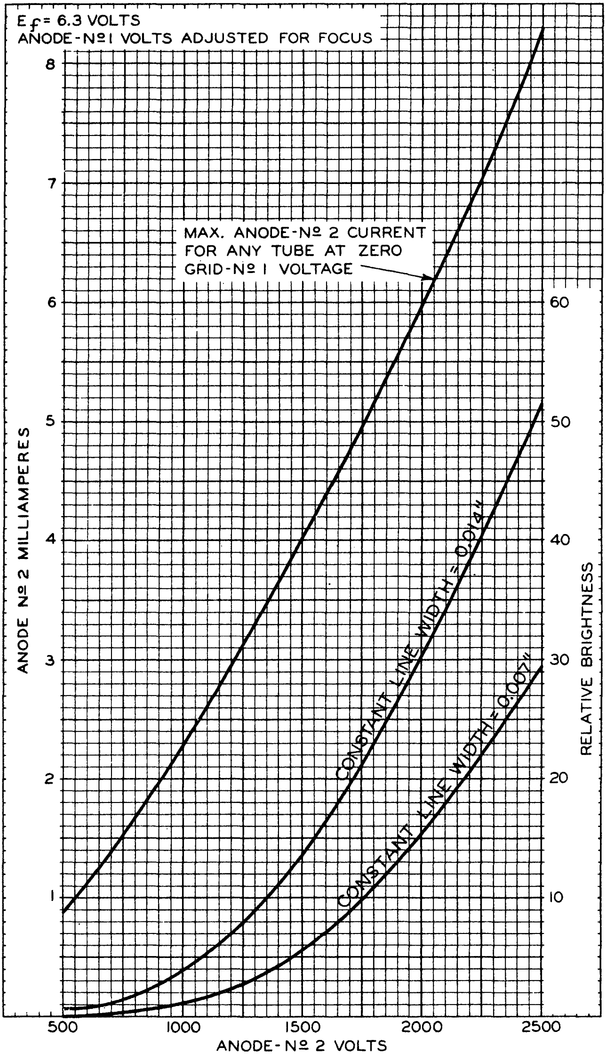
℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

92CS-6689

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

2BP1
CHARACTERISTICS

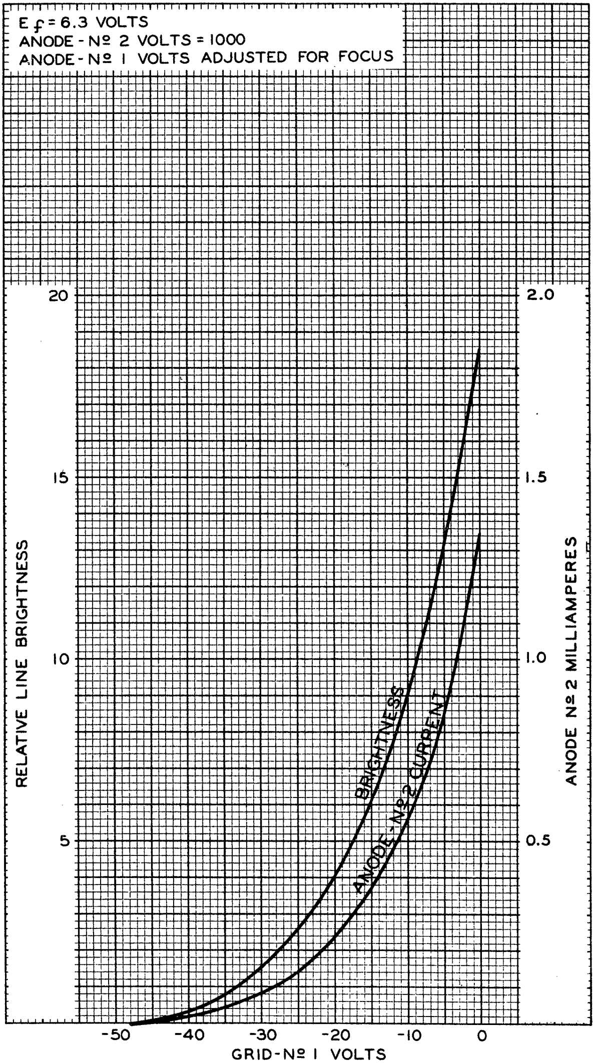


2BP1

RCA

2BP1

AVERAGE CHARACTERISTICS



RCA

2BP11

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

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

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

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

2F21
MONOSCOPE

5-INCH MAGNETIC-DEFLECTION TYPE

Supersedes Type 1899

General:

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

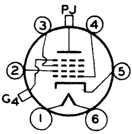
Direct Interelectrode Capacitances:
- Grid No.1 to All Other Electrodes . . . . . 7 . . . . . μμf
- Pattern Electrode to Grid No.4 . . . . 5 . . . . . μμf

Pattern:
- Type . . . . See illustration on next page
- Dimensions (Approx.) . . . . 2-5/16" x 3-1/16"
- Calibration . . . . Up to 500 lines

Focusing Method . . . . Electrostatic
Deflection Method . . . . Magnetic
Maximum Solid Deflection Angle . . . . 40°
Overall Length . . . . 12-7/16" + 1/4" − 7/16"
Greatest Diameter of Bulb . . . . 5-1/16" max.
Caps (Two) . . . . Recessed Small Ball
Mounting Position . . . . Any
Base . . . . Long-Shell Medium 6-Pin

Basing Designation for BOTTOM VIEW 6BV

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



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

Maximum Ratings, *Design-Center Values*:

PATTERN-ELECTRODE VOLTAGE	1500 max.	volts
GRID-No.4 (COLLECTOR) VOLTAGE	1500 max.	volts
GRID-No.3 (FOCUSING ELECTRODE) VOLTAGE .	600 max.	volts
GRID-No.2 (ACCELERATING ELECTRODE) VOLT.	1600 max.	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative Bias Value	125 max.	volts
Positive Bias Value	0 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

Typical Operation: ¶

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

¶,▲,#: see next page.

2F21

2F21
MONOSCOPE

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

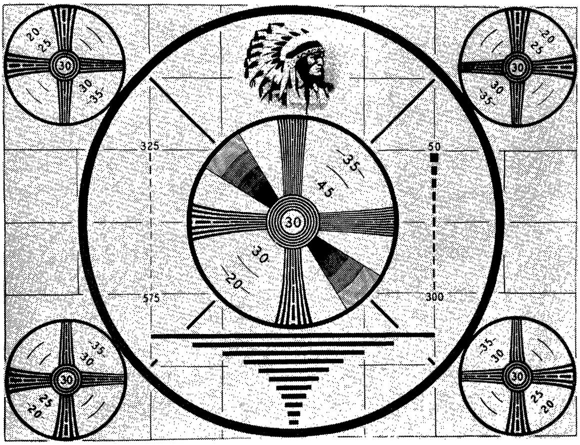
▲ Individual tubes may require between + 20% and − 20% of these values.

† 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.

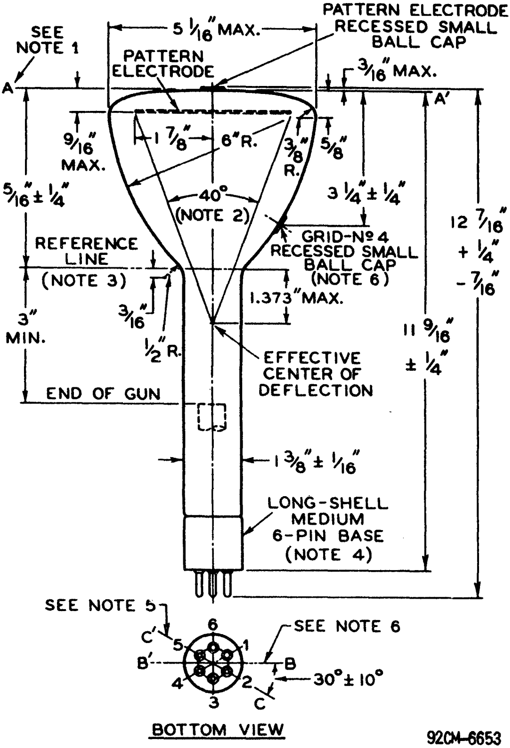
PATTERN



92CS-6665

2F21

2F21
MONOSCOPE



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

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

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

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

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

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

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3AP1-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 3AP1-A
are the same as those for Type 908-A.

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

Oscillograph Tube

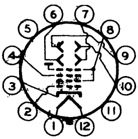
ELECTROSTATIC FOCUS — **ELECTROSTATIC DEFLECTION**

DATA

General:

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

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



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

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

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

ULTOR VOLTAGE	2750	max.	volts
	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	μa
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:

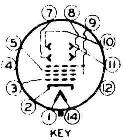
Voltage	6.3 ± 10%	ac or dc volts
Current	0.6	amp.

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes	8.5	μμf
Cathode to All Other Electrodes	8.0	μμf
DJ_1 to DJ_2	2.0	μμf
DJ_3 to DJ_4	2.0	μμf
DJ_1 to All Other Electrodes	8.0	μμf
DJ_3 to All Other Electrodes	6.0	μμf
DJ_1 to All Other Electrodes except DJ_2	6.0	μμf
DJ_2 to All Other Electrodes except DJ_1	5.0	μμf
DJ_3 to All Other Electrodes except DJ_4	4.0	μμf
DJ_4 to All Other Electrodes except DJ_3	6.0	μμf

Phosphor (For Curves, see front of this Section)	No.1
Fluorescence	Green
Persistence	Medium
Focusing Method	Electrostatic
Deflection Method	Electrostatic
Overall Length	10" ± 1/4"
Greatest Diameter of Bulb	3" ± 1/16"
Minimum Useful Screen Diameter	2-3/4"
Mounting Position	Any
Base	Medium Shell Diheptal 12-Pin
Basing Designation for BOTTOM VIEW	14C

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



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

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

With DJ_1 positive with respect to DJ_2, the spot is deflected toward pin 5. With DJ_3 positive with respect to DJ_4 the spot is deflected toward pin 2.

The angle between the trace produced by DJ_1 and DJ_2 and its intersection with the plane through the tube axis and pin 5 does not exceed 10°.

The angle between the trace produced by DJ_3 and DJ_4 and the trace produced by DJ_1 and DJ_2 is 90° ± 3°.

Maximum Ratings, *Abolute Values*:

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

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3BP1-A

3BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative Value.	200 *max.*	volts
Positive Value.	0 *max.*	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE	550 *max.*	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 *max.*	volts
Heater positive with respect to cathode	10 *max.*	volts

Typical Operation:

Anode-No.2 & Grid-No.2 Voltage■	1500	2000	volts
Anode No.1 Voltage for Focus at 75% of Grid-No.1 Voltage for Cutoff● .	430	575	volts
Grid-No.1 Volt. for Visual Cutoff#	-45	-60	volts
Max. Anode-No.1 Current Range▲	Between -50 and +10		µamp.
Deflection Sensitivity:			
DJ_1 and DJ_2	0.169	0.127 . .	mm/v dc
DJ_3 and DJ_4	0.229	0.172 . .	mm/v dc
Deflection Factor:**			
DJ_1 and DJ_2	150	200 . .	v dc/in.
DJ_3 and DJ_4	111	148 . .	v dc/in.

■ Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 1500 volts.

● Individual tubes may require between +20% and -30% of the values shown with grid-No.1 voltages between zero and cutoff.

Visual extinction of stationary focused spot. Supply should be adjustable to ± 50% of these values.

▲ See curve for average values.

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

Spot Position:

The undeflected focused spot will fall within a 15-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ_1 and DJ_2. Suitable test conditions are: anode-No.2 voltage, 1500 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 megohm each, connected to anode No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

Maximum Circuit Values:

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

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

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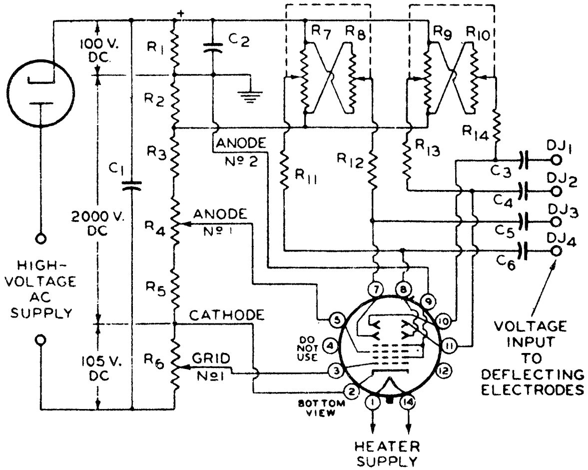
3BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



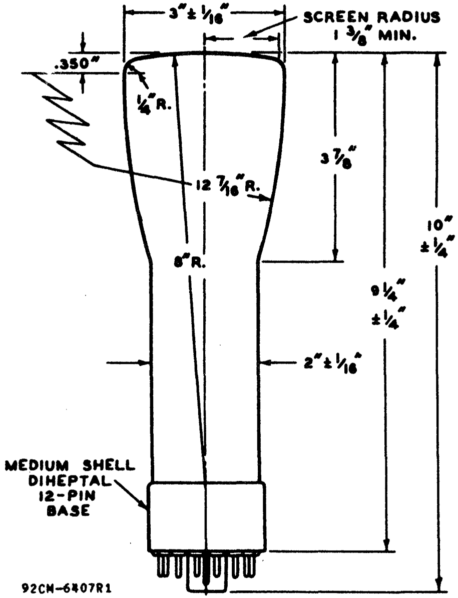
92CS-6514

C1: 0.1 μf
C2: 1.0 μf
C3 C4 C5 C6: 0.05-μf Blocking Capacitors*
R1 R2: 2 Megohms
R3: 5.5 Megohms
R4: 2-Megohm Potentiometer
R5: 1.5 Megohms
R6: 0.5-Megohm Potentiometer
R7 R8: Dual 5-Megohm Potentiometer
R9 R10: Dual 5-Megohm Potentiometer
R11 R12 R13 R14: 2 Megohms

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

3BP1-A

HIGH-VACUUM CATHODE-RAY TUBE



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

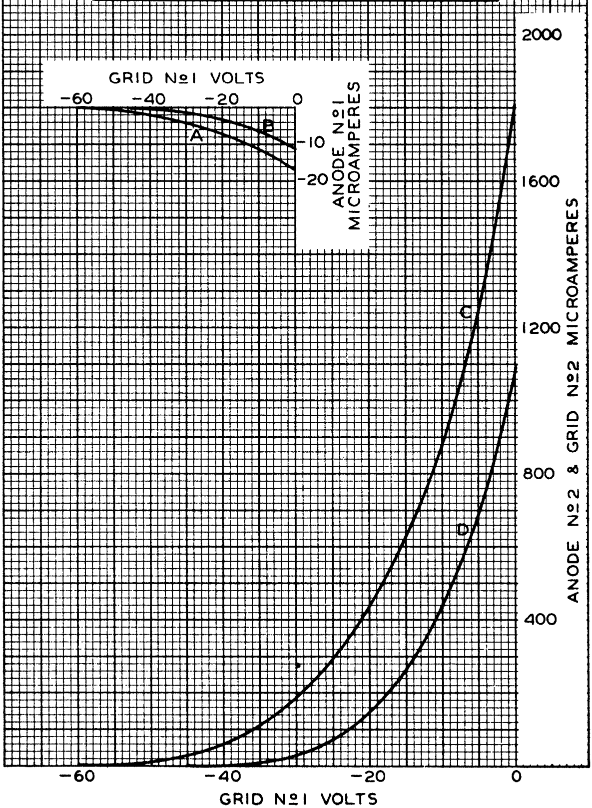
RCA

3BP1-A

AVERAGE CHARACTERISTICS

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

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



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3JPI

RCA

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 $\mu\mu f$
- Cathode to All Other Electrodes . . . . . . 8 $\mu\mu f$
- DJ_1 to DJ_2 . . . . 2.5 $\mu\mu f$
- DJ_3 to DJ_4 . . . . 2 $\mu\mu f$
- DJ_1 to All Other Electrodes . . . . 8 $\mu\mu f$
- DJ_2 to All Other Electrodes . . . . 7 $\mu\mu f$
- DJ_3 to All Other Electrodes . . . . 7 $\mu\mu f$
- DJ_4 to All Other Electrodes . . . . 8 $\mu\mu f$

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" ± 1/4"

Greatest Diameter of Bulb . . . . 3" ± 1/16"

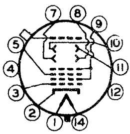
Minimum Useful Screen Diameter . . . . 2-3/4"

Mounting Position . . . . Any

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

Base . . . . Medium-Shell Diheptal 12-Pin (JETEC No.B12-37)
- Basing Designation for BOTTOM VIEW . . . . $14J_1$

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



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

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

With DJ_1 positive with respect to DJ_2, the spot is deflected toward pin 5. With DJ_3 positive with respect to DJ_4, the spot is deflected toward pin 2.

The plane through the tube axis and each of the following items may vary from the trace produced by DJ_1 and DJ_2 by the following angular tolerances measured about the tube axis: Pin 5, 10^o; Cap (on same side of tube as pin 5), 10^o.

The angle between DJ_1 - DJ_2 trace and DJ_3 - DJ_4 trace is $90^o \pm 3^o$.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

3JP1

3JP1
OSCILLOGRAPH TUBE

Maximum Ratings, *Design-Center Values:*

ANODE-No.3 VOLTAGE	4000 max.	volts
ANODE-No.2□ VOLTAGE	2000 max.	volts
RATIO OF ANODE-No.3 VOLTAGE TO ANODE-No.2 VOLTAGE	2.3 : 1 max.	
ANODE-No.1 VOLTAGE	1000 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	200 max.	volts
Positive bias value●	0 max.	volts
Positive peak value	2 max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	125 max.	volts

Equipment Design Ranges:

For any anode-No.3 voltage (Eb_3) between 2000* and 4000 volts and any anode-No.2 voltage (Eb_2) between 1500** and 2000 volts

Anode-No.1 Voltage	20% to 34.5% of Eb_2	volts
Grid-No.1 Voltage†	1.5% to 4.5% of Eb_2	volts
Anode-No.1 Current for any Operating Condition	-50 to +10	μamp
Deflection Factors:		
	When $Eb_3 = 2 \times Eb_2$	
DJ_1 & DJ_2	85 to 115	v dc/in./kv of Eb_2
DJ_3 & DJ_4	62.5 to 85	v dc/in./kv of Eb_2
	When $Eb_3 = Eb_2$	
DJ_1 & DJ_2	68 to 92	v dc/in./kv of Eb_2
DJ_3 & DJ_4	50 to 68	v dc/in./kv of Eb_2
Spot Position	#	

□ Anode No.2 and grid No.2, which are connected together within tube, and referred to herein as anode No.2.

● At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode-No.2 input power to 6 watts.

* It is recommended that anode-No.3 voltage be not less than 3000 volts for high-speed transients.

** Recommended minimum value of anode-No.2 voltage.

With heater voltage of 6.3 volts, anode-No.3 voltage of 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 DJ_1 and DJ_2.

†: See next page.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

3JPI

OSCILLOGRAPH TUBE

Examples of Use of Design Ranges:

For anode-No.3 voltage of	*2000*	*3000*	*4000*	*volts*
and anode-No.2 voltage of	*2000*	*1500*	*2000*	*volts*
Anode-No.1 Volt.	400 to 690	300 to 515	400 to 690	volts
Grid-No.1 Volt.†	-30 to -90	22.5 to -67.5	-30 to -90	volts
Deflection Factors:				
DJ_1 & DJ_2. . . .	136 to 184	127 to 173	170 to 230	■
DJ_3 & DJ_4. . . .	100 to 136	94 to 128	125 to 170	■

Maximum Circuit Values:

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

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

† For visual extinction of undeflected focused spot.

■ Volts dc/in.

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

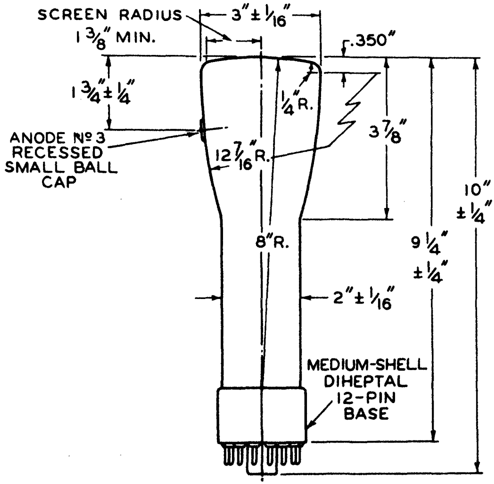
OPERATING NOTES

The 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.

3JP1
OSCILLOGRAPH TUBE



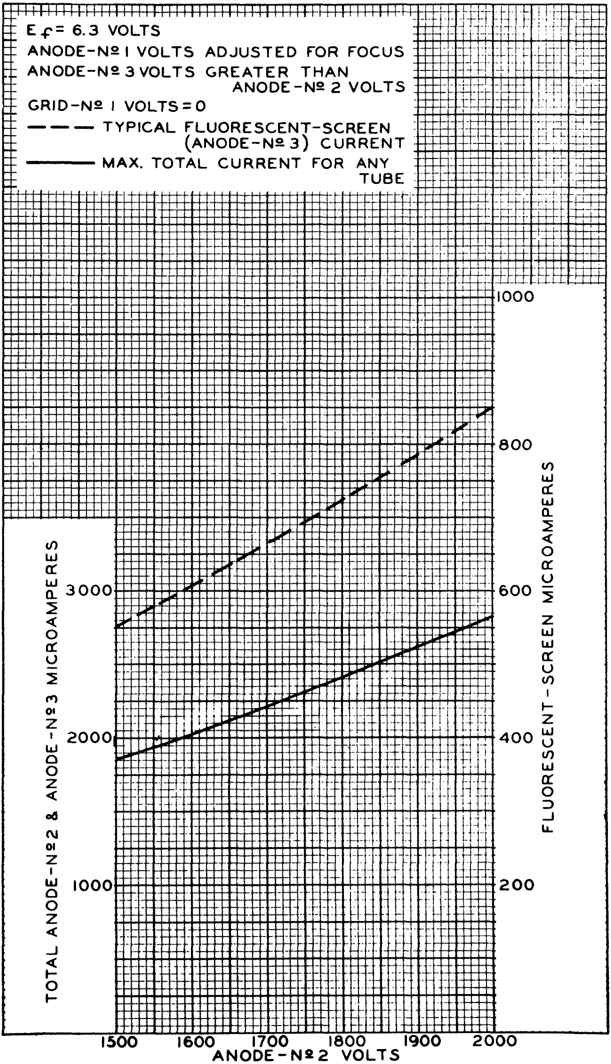
℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF BASE.

92CM-6583

RCA

3JP1

CHARACTERISTICS



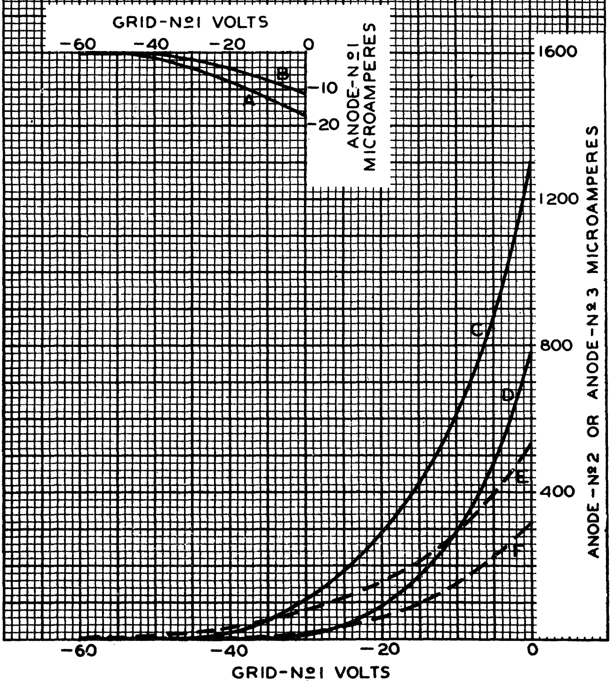
3JPI

3JPI

AVERAGE CHARACTERISTICS

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

CURVE	ELECTRODE CURRENT	ANODE-No 2 VOLTS	ANODE-No 3 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



JUNE 22, 1951

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92CM-7670

3JP7

OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

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

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

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

GENERAL DATA, MAXIMUM RATINGS, AND EQUIPMENT DESIGN RANGES

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

With heater voltage of 6.3 volts, anode-No.3 voltage of 4000 volts, anode-No.2 voltage of 2000 volts, anode-No.1 voltage adjusted for focus, grid-No.1 voltage adjusted to give spot that is just visible, each deflecting electrode connected through 1-megohm resistor to anode No.2, and tube shielded from all extraneous fields, the undeflected focused spot will fall within a 12-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ_1 and DJ_2.

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

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

3KPI
OSCILLOGRAPH TUBE

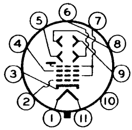
ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

DATA

General:

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

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Cathode
Pin 4 - Grid No.3
Pin 5 - Deflecting Electrode DJ_3
Pin 6 - Deflecting Electrode DJ_4
Pin 7 - Ultor (Grid No.2, Grid No.4, Collector)



Pin 8 - Deflecting Electrode DJ_2
Pin 9 - Deflecting Electrode DJ_1
Pin 10 - Internal Connection-Do Not Use
Pin 11 - Heater

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

← Indicates a change.

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3KP1

RCA

3KP1

OSCILLOGRAPH TUBE

With DJ_1 positive with respect to DJ_2, the spot is deflected toward pin 4. With DJ_3 positive with respect to DJ_4, the spot is deflected toward pin 1.

The plane through the tube axis and pin 1 may vary from the trace produced by DJ_3 and DJ_4 by $\pm10^{\circ}$ (measured about the tube axis).

The angle between DJ_1 - DJ_2 trace and DJ_3 - DJ_4 trace is 90° $\pm3^{\circ}$.

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_{c_4}) between recommended minimum and 2500 volts*

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

Examples of Use of Design Ranges:

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

* Brilliance and definition decrease with decreasing ultor voltage. Recommended minimum for the 3KP1 in general service is 1000 volts but a value as low as 500 volts may be used under conditions of low-velocity deflection and low ambient-light levels.

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

→ Indicates a change.

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3KPI

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3KPI

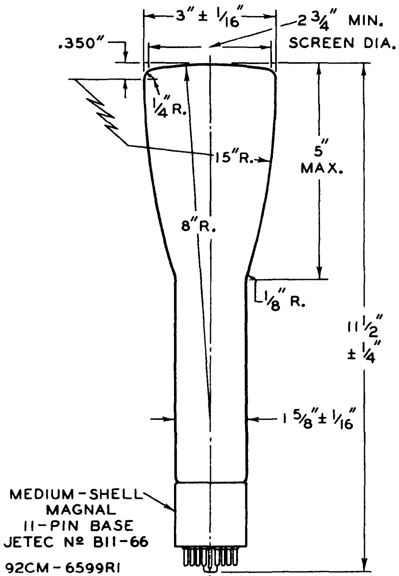
OSCILLOGRAPH TUBE

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

Maximum Circuit Values:

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

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



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

← Indicates a change.

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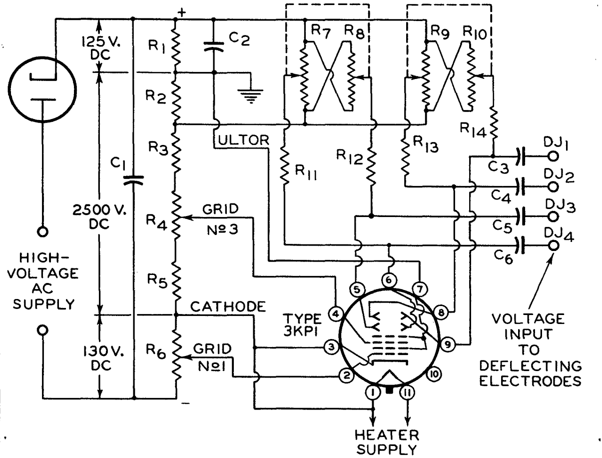
3KPI

3KPI

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.1 µf, 3000 Volts
C2: 1.0 µf, 200 Volts
C3 C4 C5 C6: 0.05-µf Blocking Capacitors*
R1 R2: 2 Megohms, 0.5 Watt
R3: 6 Megohms, 0.5 Watt
R4: 2-Megohm Potentiometer, 0.5 Watt
R5: 1.0 Megohm, 0.5 Watt
R6: 0.5-Megohm Potentiometer, 0.5 Watt
R7 R8: Dual 5-Megohm Potentiometer, 0.5 Watt
R9 R10: Dual 5-Megohm Potentiometer, 0.5 Watt
R11 R12 R13 R14: 2 Megohms, 0.5 Watt

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

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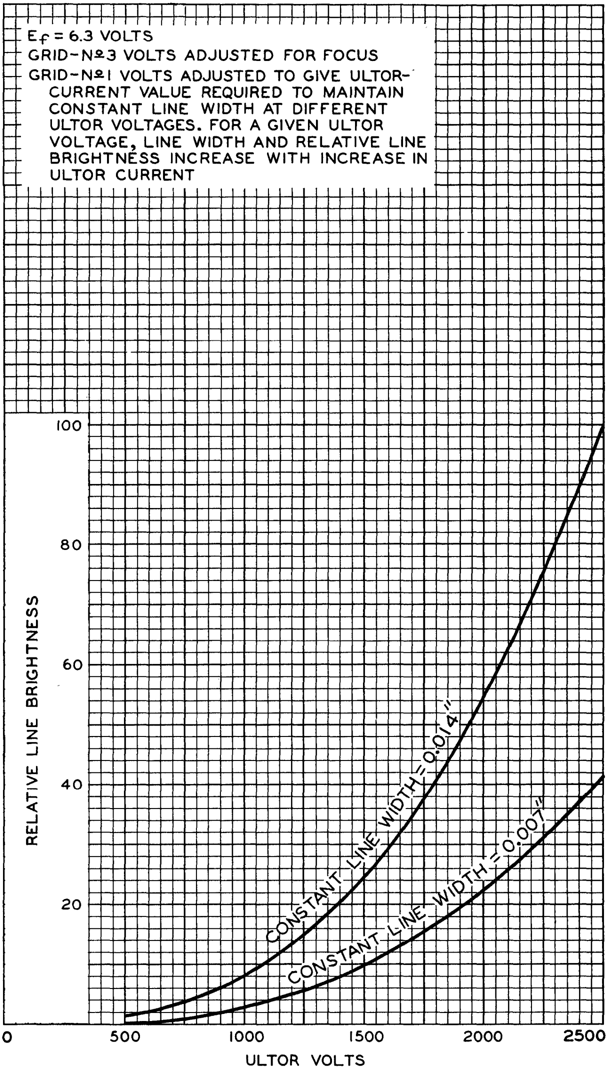
3KP1

CHARACTERISTICS



3KP1

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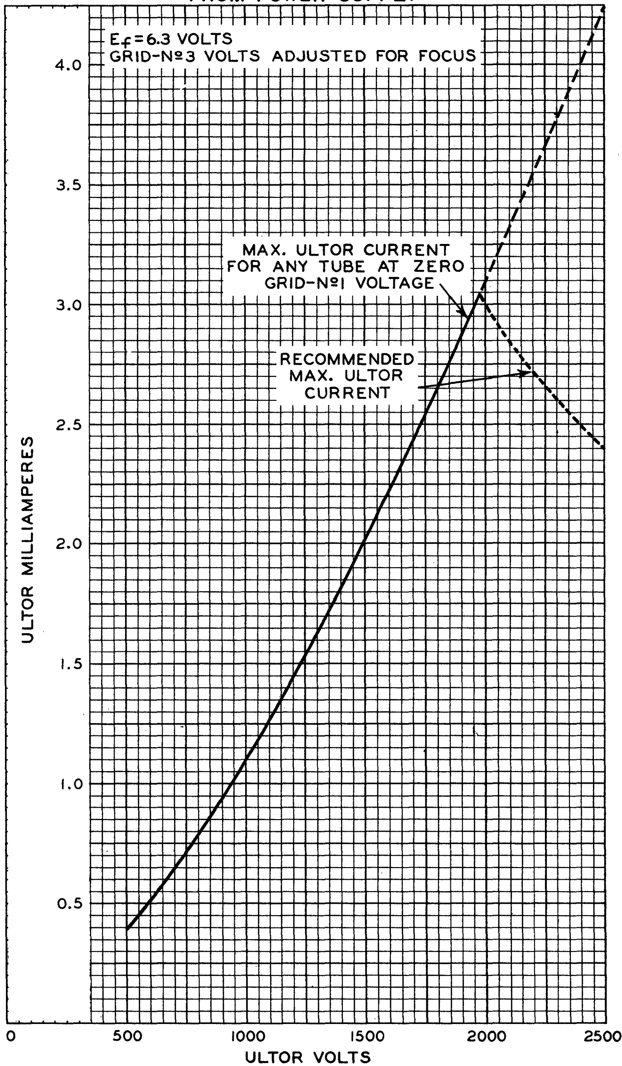
3KP1

MAXIMUM ULTOR-CURRENT REQUIREMENTS
FROM POWER SUPPLY



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92CM-7192R1

3KPI

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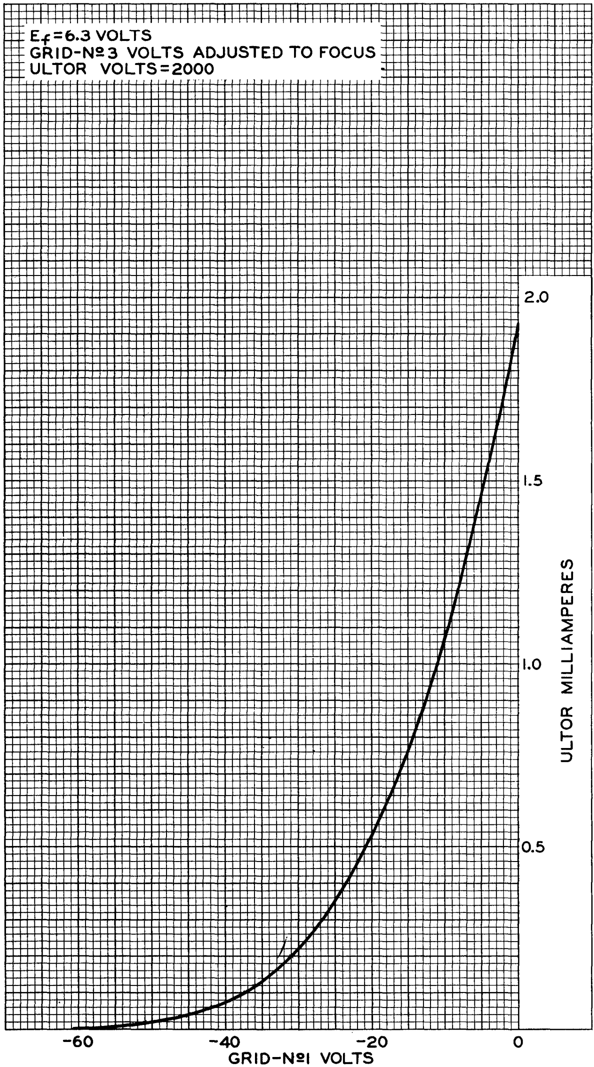
3KPI

AVERAGE CHARACTERISTIC



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92CM-6658R2

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3KP4

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

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

General:

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

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

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

3KP7

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

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

General:

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

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

3KP11

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

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

General:

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

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

← Indicates a change.

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.

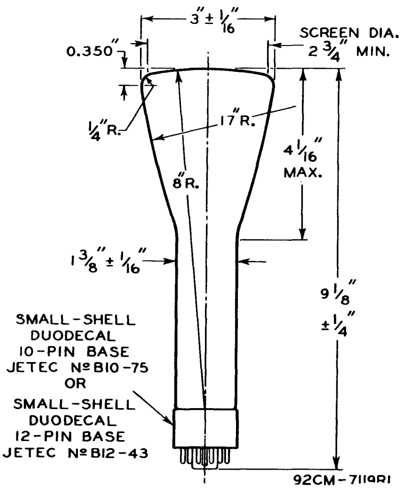
3RP1
OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

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

General:

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



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

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3RP1-A

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS — ELECTROSTATIC DEFLECTION

DATA

General:

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

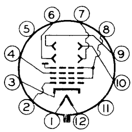
Direct Interelectrode Capacitances (Approx.):

Grid No.1 to all other electrodes	8	μμf
Deflecting electrode DJ_1 to deflecting electrode DJ_2	2	μμf
Deflecting electrode DJ_3 to deflecting electrode DJ_4	2	μμf
DJ_1 to all other electrodes	11	μμf
DJ_2 to all other electrodes	8	μμf
DJ_3 to all other electrodes	7	μμf
DJ_4 to all other electrodes	8	μμf

Faceplate . . . . Flat Clear Glass
Phosphor (For Curves, see front of this Section). P1
- Fluorescence. Green
- Phosphorescence . . . . Green
  - Persistence . . . . Medium

Focusing Method . . . . Electrostatic
Deflection Method . . . . Electrostatic
Overall Length. . . . . 9-1/8" ± 1/4"
Greatest Diameter of Bulb . . . . 3" ± 1/16"
Minimum Useful Screen Diameter. . . . . 2-3/4"
Mounting Position . . . . Any
Weight (Approx.). . . . . 12 oz
Bulb. J-24S1
Base. . . . . . Small-Shell Duodecal 10-Pin (JETEC No.B10-75), or Small-Shell Duodecal 12-Pin (JETEC No.B12-43)
- Basing Designation for BOTTOM VIEW. 12E

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



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

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

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

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^o (measured about the tube axis).

The angle between DJ_1 - DJ_2 trace and DJ_3 - DJ_4 trace is $90^o \pm 3^o$.

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

ULTOR° VOLTAGE	2500 max.	volts
ULTOR INPUT (AVERAGE)	6 max.	watts
GRID-No.3 VOLTAGE	1000 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	200 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK VOLTAGE BETWEEN ULTOR AND ANY DEFLECTING ELECTRODE	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

Equipment Design Ranges:

For any ultor voltage (E_{c_4}) between 500 and 2500 volts*

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

° The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 3RP1-A, the ultor function is performed by grid No.4. Since grid No.4, grid No.2, and collector are connected together within the 3RP1-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

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

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

RCA

3RP1-A

OSCILLOGRAPH TUBE

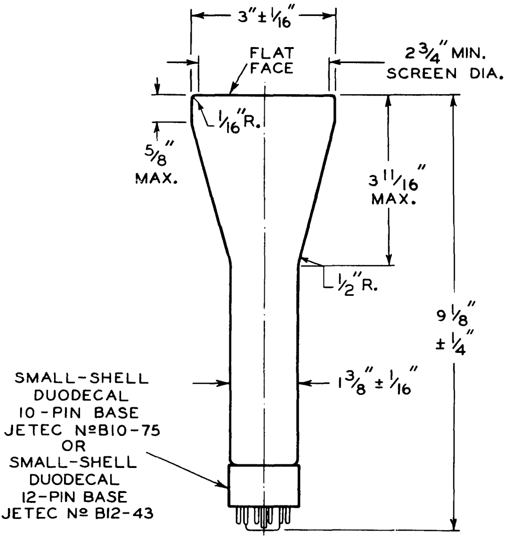
Examples of Use of Design Ranges:

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 Undeflected 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.



92CS-8497

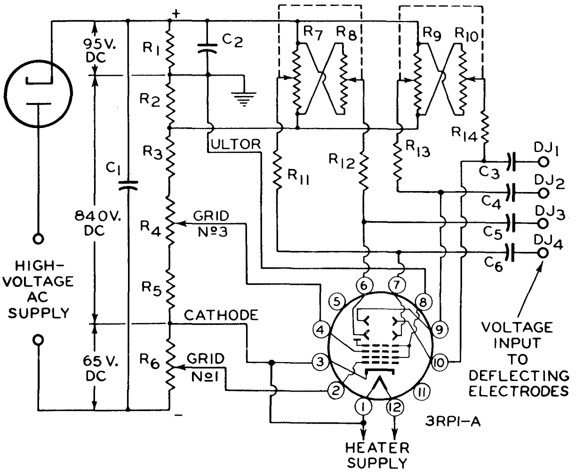
CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

3RP1-A

RCA

3RP1-A
OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT

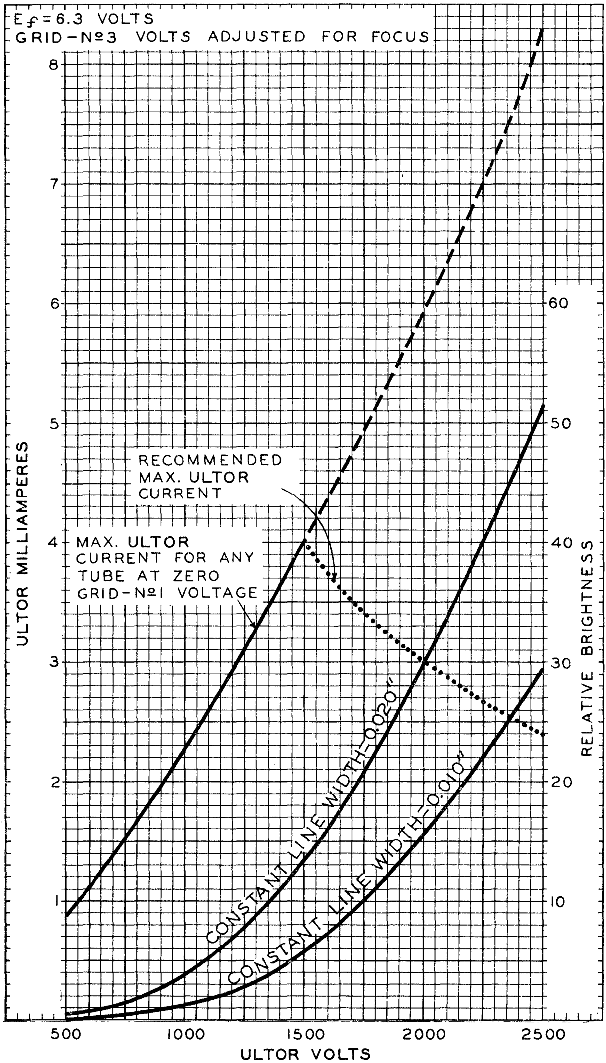


92CS-6777R1

C1: 0.2 μf
C2: 1.0 μf
C3 C4 C5 C6: 0.05-μf Blocking Capacitors*
R1 R2: 2.5 Megohms, 0.5 Watt
R3: 2.5 Megohms, 1 Watt
R4: 1.0-Megohm Potentiometer
R5: 0.5 Megohm, 0.5 Watt
R6: 0.35 Megohm, 0.5 Watt
R7 R8: Dual 5-Megohm Potentiometer
R9 R10: Dual 5-Megohm Potentiometer
R11 R12 R13 R14: 2 Megohms, 0.5 Watt

* When cathode is grounded, capacitors should have high voltage rating; when 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.

3RPI-A
CHARACTERISTICS



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92CM-7143RI

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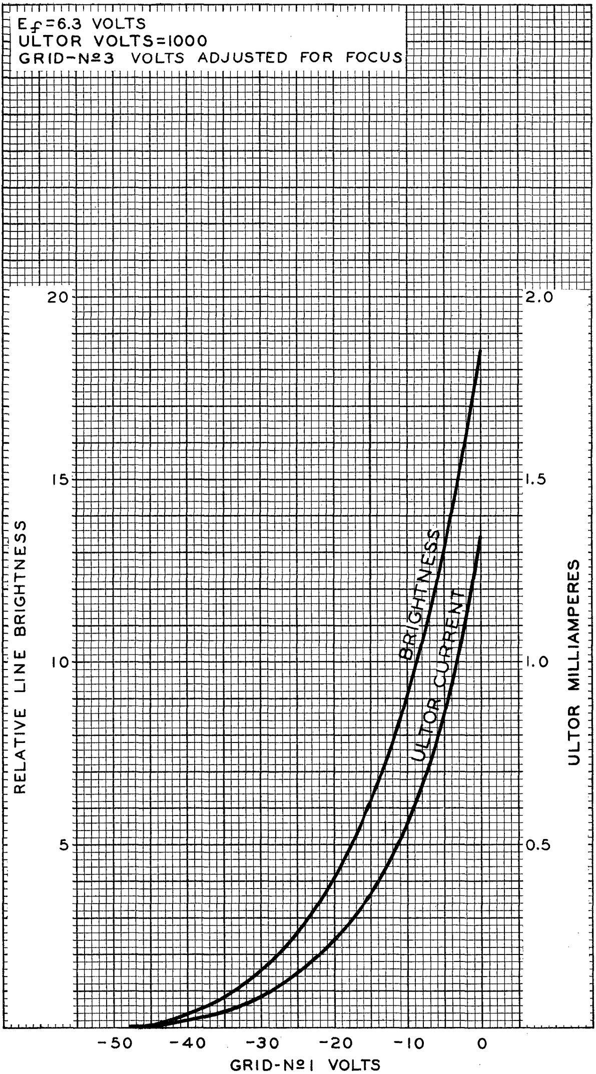
3RP1-A

AVERAGE CHARACTERISTICS



3WPI

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

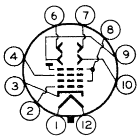
DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	4.6 to 8.7	μμf
Cathode to all other electrodes	3 to 5.7	μμf
Deflecting electrode DJ_1 to deflecting electrode DJ_2	1.7 to 3.3	μμf
Deflecting electrode DJ_3 to deflecting electrode DJ_4	1 to 2	μμf
DJ_1 to all other electrodes	5.5 to 10.5	μμf
DJ_2 to all other electrodes	5.5 to 10.5	μμf
DJ_3 to all other electrodes	3.5 to 6.8	μμf
DJ_4 to all other electrodes	3.5 to 6.8	μμf

Faceplate, Flat. . . . . Clear Glass
Phosphor (For Curves, see front of this Section) P1
Fluorescence . . . . Green
Phosphorescence . . . . Green
Persistence . . . . Medium
Focusing Method . . . . Electrostatic
Deflection Method . . . . Electrostatic
Deflecting-electrode arrangement . . . . *See Dimensional Outline*
Overall Length . . . . 11-1/2" ± 1/8"
Greatest Diameter of Bulb . . . . 3" ± 1/16"
Minimum Useful Screen Diameter . . . . 2-3/4"
Minimum Useful Scan (Centered with respect to tube face):
By deflecting electrodes DJ_1 & DJ_2 . . . . 2-1/2"
By deflecting electrodes DJ_3 & DJ_4 . . . . 2-1/4"
Weight (Approx.) . . . . 1 lb
Mounting Position . . . . Any
Bulb J24R
Base . . . . . Small-Shell Duodecal 10-Pin (JETEC No.B10-75), or Small-Shell Duodecal 12-Pin (JETEC No.B12-43)
Basing Designation for BOTTOM VIEW 12T

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



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

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3WP1

OSCILLOGRAPH TUBE

Maximum Ratings, *Design-Center Values:*

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

Equipment Design Ranges:

For any ultor voltage (E_{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 Extinction of Undeflected Focused Spot	-3% to -5% of E_{c4}	volts
Grid-No.3 Current for Any Operating Condition	-15 to +10	μa
Deflection Factors:		
DJ_1 & DJ_2	41.5 to 50.5	v dc/in./kv of E_{c4}
DJ_3 & DJ_4	28.5 to 35	v dc/in./kv of E_{c4}
Spot Position	##	

Examples of Use of Design Ranges:

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

* Brilliance and definition decrease with decreasing ultor voltage. Recommended minimum for the 3WP1 in general service is 1000 volts but a value as low as 500 volts may be used under conditions of low-velocity deflection and low ambient-light levels.

##: See next page.

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 DJ_1 and DJ_2. For *line-width measurement,* the high-frequency scanning is adjusted to give a raster width of 6.9 cm with the grid-No.3 voltage adjusted to give sharpest focus at center of tube face. Raster height is contracted until the individual scanning lines are just barely distinguishable. *Line width* is expressed as the quotient of the contracted raster height measured at the center line of the tube face divided by the number of scanning lines (49).

§ Under the following conditions: heater voltage of 6.3 volts, grid-No.3 voltage adjusted for focus, and grid-No.1 voltage adjusted to give visible raster. With 49-line raster centered with respect to the tube face and size adjusted to give mean dimensions of 1.875" in 1DJ2 direction and 1.688" in 3DJ4 direction, all points on the raster will lie within the area between the two rectangles also centered with respect to the tube face; the one, 1.920" in 1DJ2 direction by 1.730" in 3DJ4 direction; the other, 1.830" in 1DJ2 direction and 1.646" in 3DJ4 direction.

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

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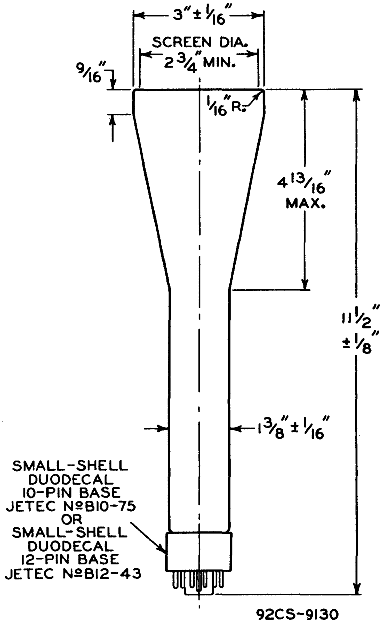
3WP1

OSCILLOGRAPH TUBE



92CS-9130

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

THE PLANE THROUGH THE TUBE AXIS AND PIN 3 MAY VARY FROM THE TRACE PRODUCED BY DJ_1 AND DJ_2 BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. ANGLE BETWEEN DJ_1 - DJ_2 TRACE AND DJ_3 - DJ_4 TRACE IS 90° ± 1°.

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

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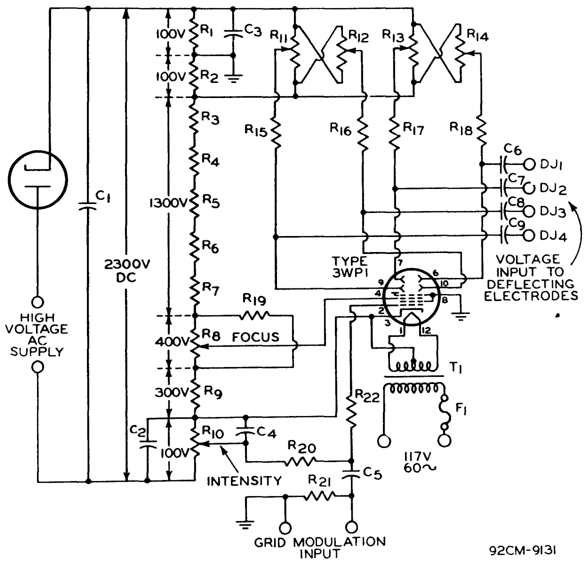
3WP1

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.5 μf, 3000 volts
C2: 8 μf, 250 volts
C3: 1 μf, 200 volts
C4: 1 μf, 200 volts
C5: 0.05 μf, 3000 volts
C6 C7 C8 C9: 0.05 μf, 600 volts
R1 R2: 510000 ohms, 1/2 watt
R3 R4 R5 R6: 270000 ohms, 1/2 watt
R7: 220000 ohms, 1/2 watt
R8: 500000-ohm potentiometer, 1/2 watt
R9: 300000 ohms, 1/2 watt
R10: 100000-ohm potentiometer, 1/2 watt
R11 R12: Dual 1-megohm potentiometer, 1/2 watt
R13 R14: Dual 1-megohm potentiometer, 1/2 watt
R15 R16 R17 R18: 1.5 megohms, 1/2 watt
R19: 2 megohms, 1 watt
R20: 510000 ohms, 1/2 watt
R21: 5 megohms, 1/2 watt
R22: 5100 ohms, 1/2 watt
T1: Transformer, with 6.3-volt/1-ampere secondary, insulated for at least 3000 volts, such as Thordarson T26F65.
F1: 1-ampere fuse

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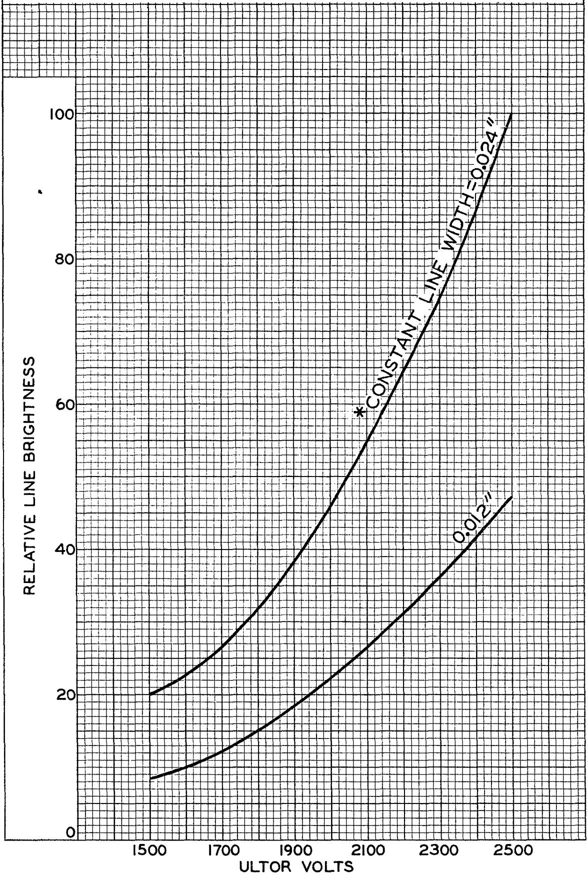
3WP1

AVERAGE CHARACTERISTICS

E_f = 6.3 VOLTS
GRID-№3 VOLTS ADJUSTED FOR FOCUS.
GRID-№1 VOLTS ADJUSTED TO GIVE ULTOR-CURRENT VALUE REQUIRED TO MAINTAIN CONSTANT LINE WIDTH AT DIFFERENT ULTOR VOLTAGES. FOR A GIVEN ULTOR VOLTAGE, LINE WIDTH AND RELATIVE LINE BRIGHTNESS INCREASE WITH INCREASE IN ULTOR CURRENT.

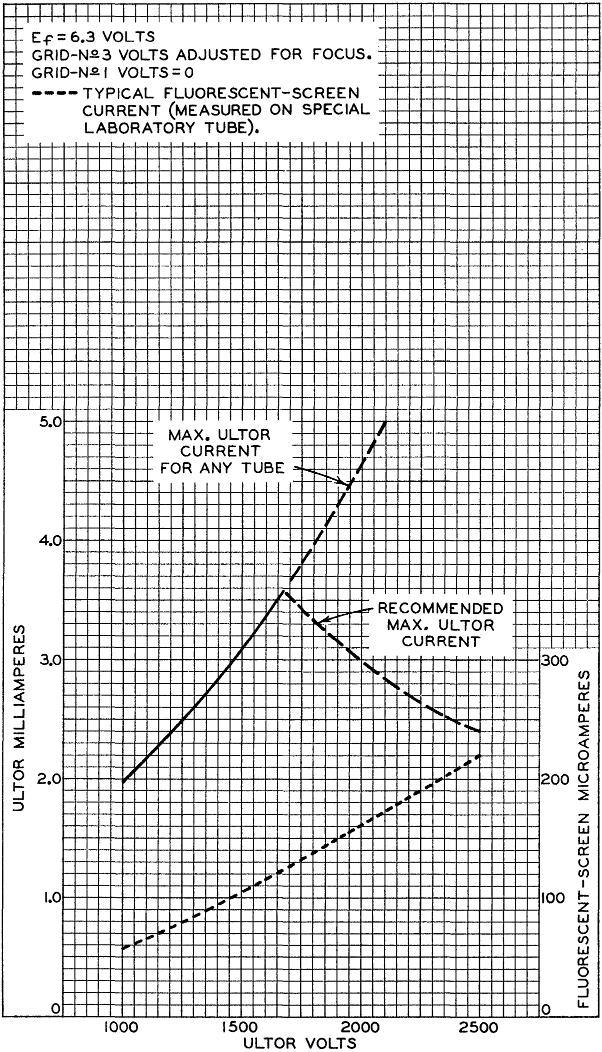
* LINE WIDTH MEASURED BETWEEN POINTS WHERE BRIGHTNESS WAS APPROX. 1/2 THAT AT CENTER OF LINE.



RCA

3WPI

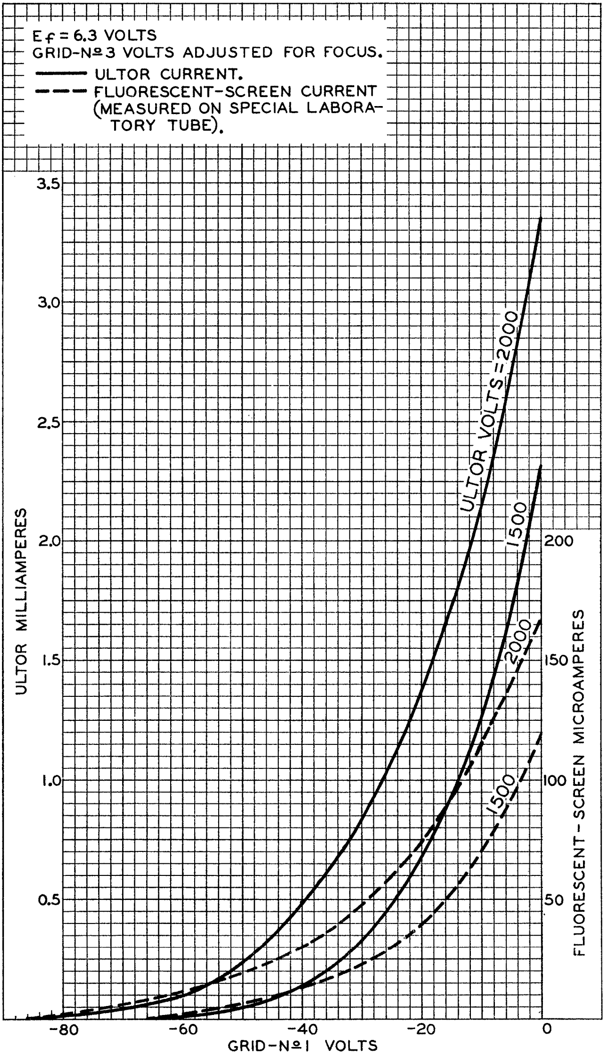
CHARACTERISTICS



92CM-9158

3WP1

AVERAGE CHARACTERISTICS



92CM-9159

3WP2

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:

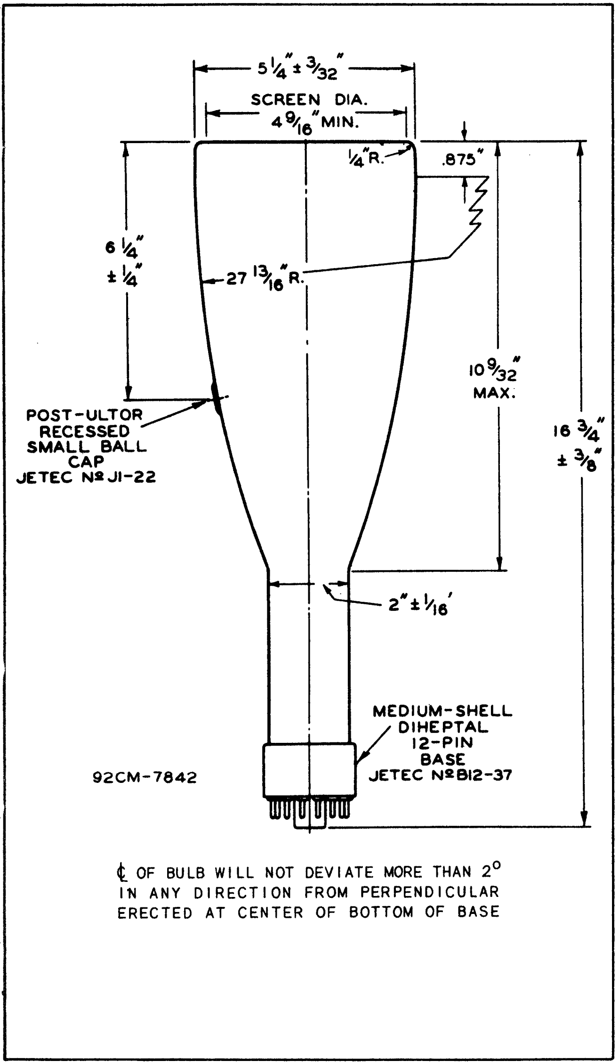
Phosphor (For Curves, see front of this Section) P11
Fluorescence . . . . Blue
Phosphorescence . . . . Blue
Persistence . . . . Short

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.

RCA

5ABP1

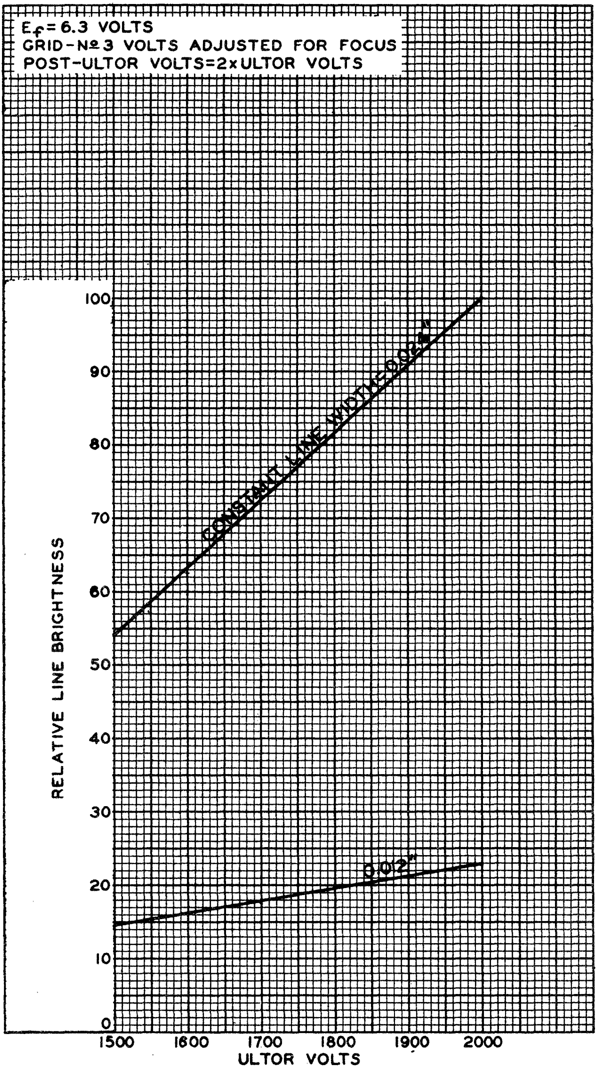
OSCILLOGRAPH TUBE



RCA

5ABP1

TYPICAL CHARACTERISTICS



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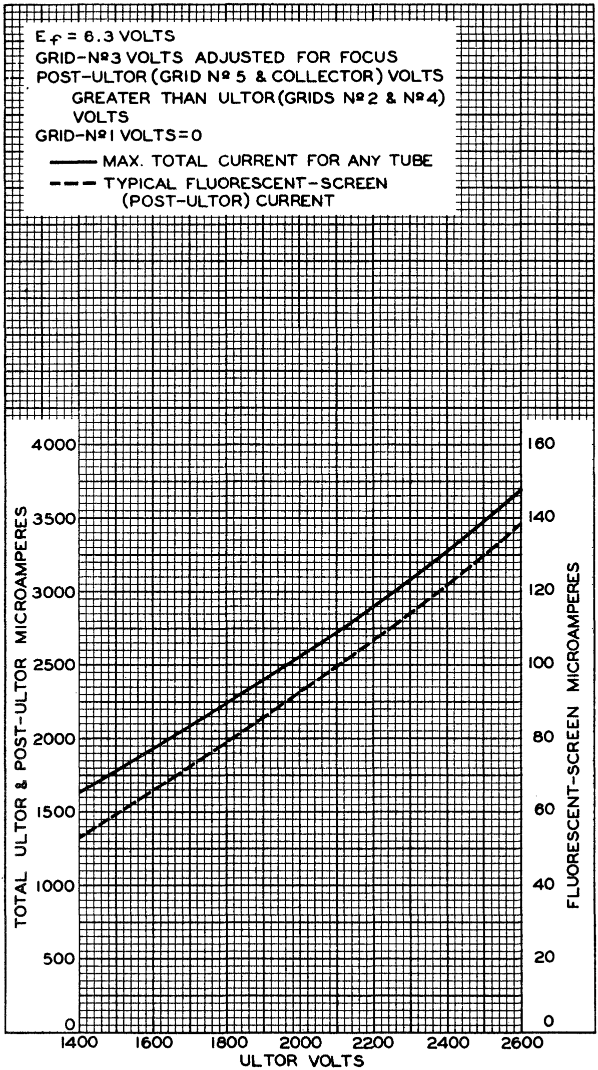
5ABP1

CHARACTERISTICS

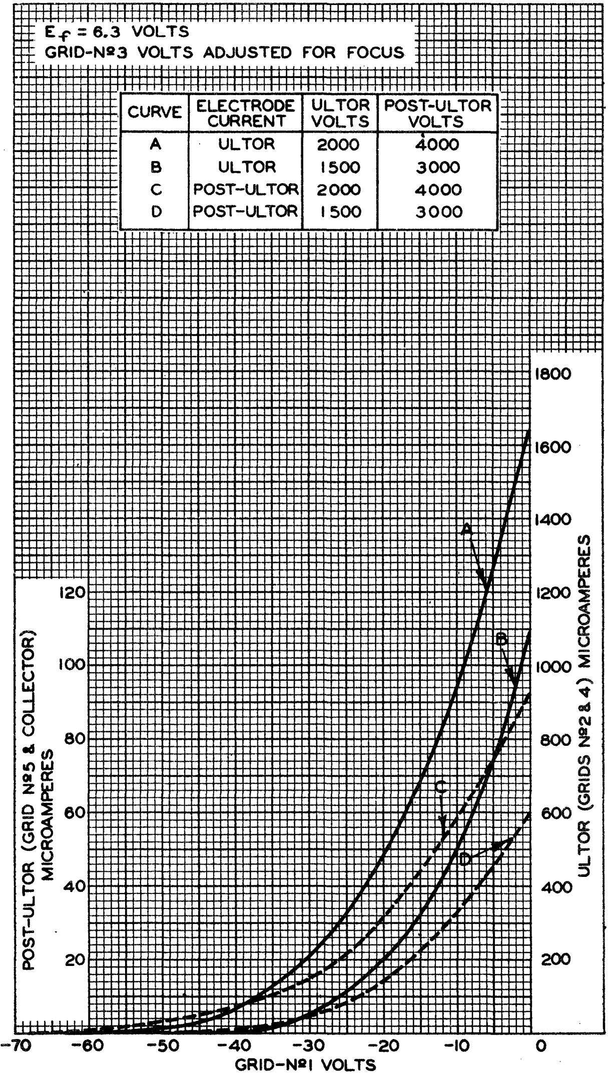


5ABP1

RCA

5ABP1

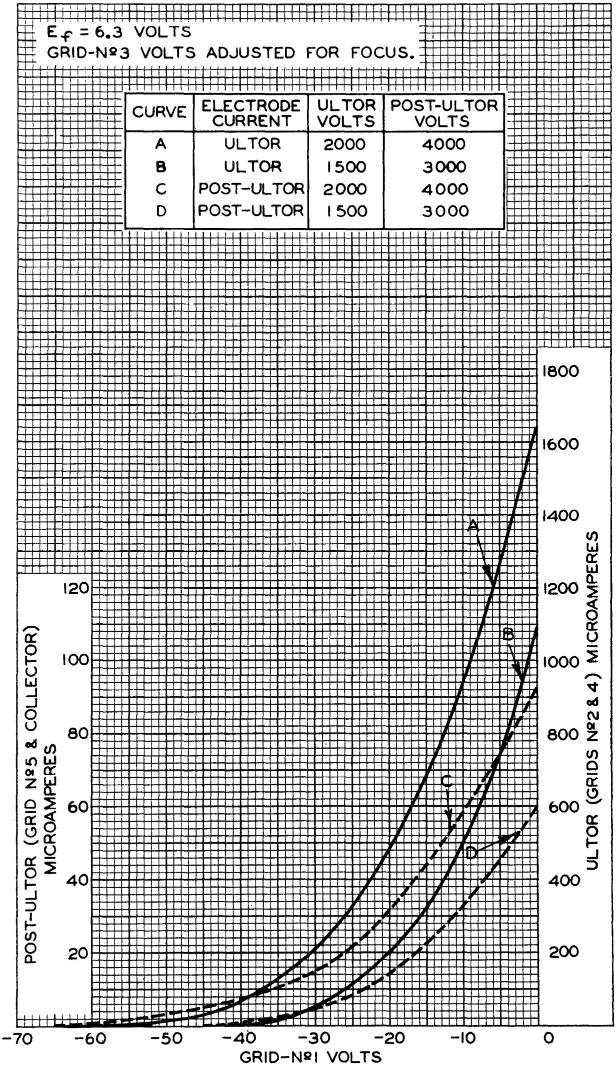
AVERAGE CHARACTERISTICS



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

5ADP1

AVERAGE CHARACTERISTICS



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

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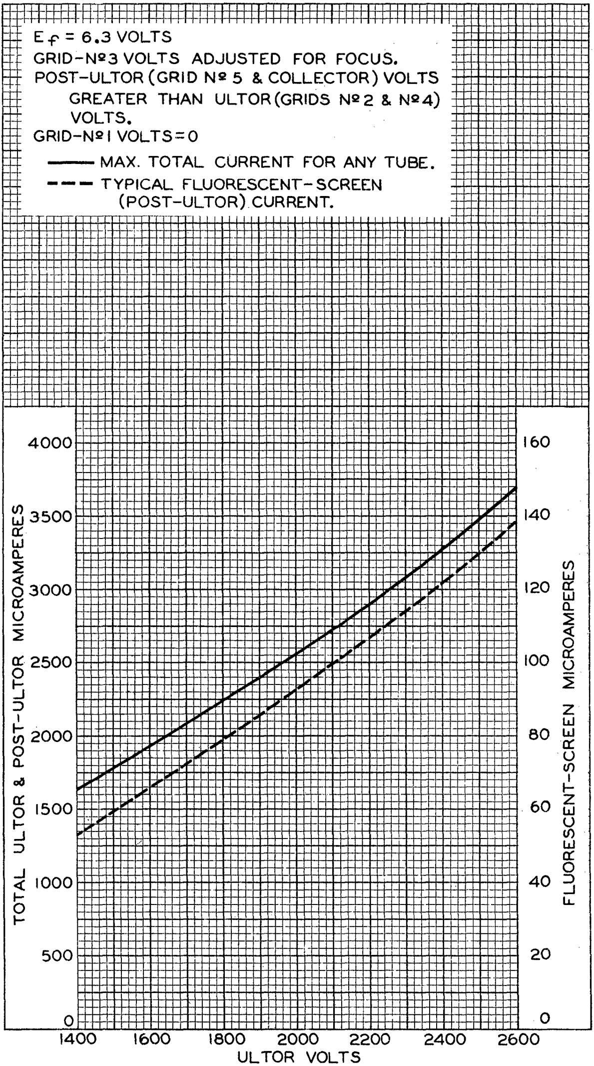
5ADP1

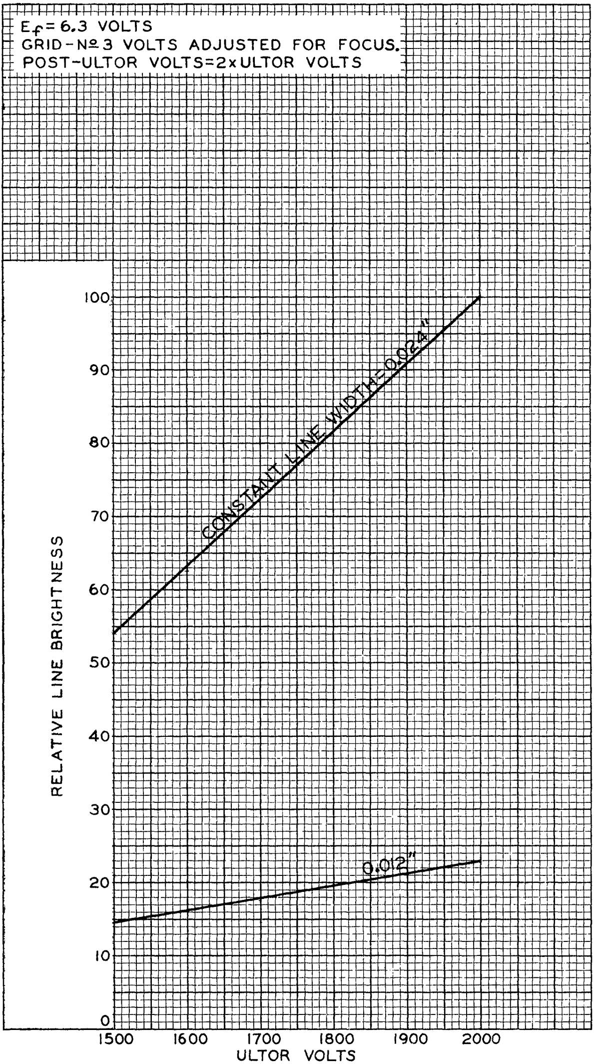
CHARACTERISTICS



RCA

5ADP1

TYPICAL CHARACTERISTICS



92CM-6820R1

RCA

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

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5ADP1
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

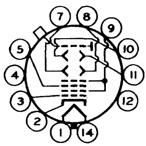
Mounting Position. . . . . .Any

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



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

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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5ADP1

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 Extinction of Undeflected Focused Spot	-2.25% to -3.75% of E_{c_4}	volts
Grid-No.3 Current for Any Operating Condition	-15 to +10	μamp
Deflection Factors:#		
When $E_{c_5} = 2 \times E_{c_4}$:		
DJ_1 & DJ_2	26.7 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.

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5ADP1
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 Undeflected 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 5ADP1 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 DJ_1 and DJ_2. 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.

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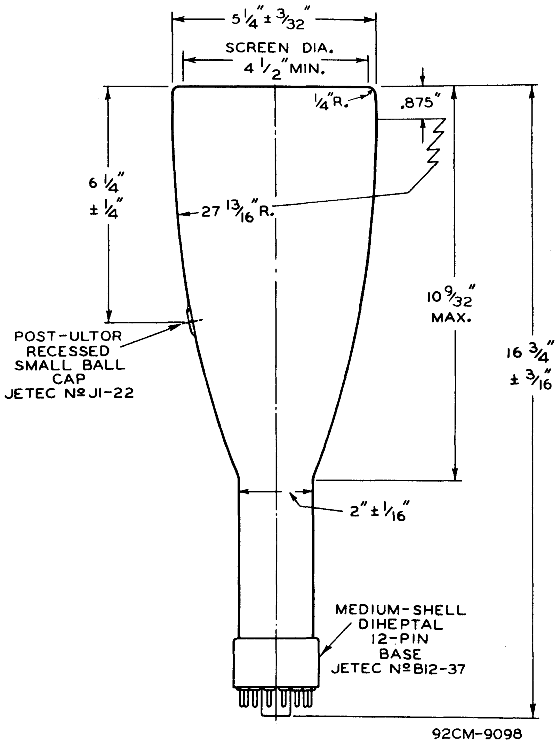
5ADP1

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 TUBE AXIS AND EACH OF THE FOLLOWING ITEMS MAY VARY FROM THE TRACE PRODUCED BY DJ_1 AND DJ_2 BY THE FOLLOWING ANGULAR TOLERANCES (MEASURED ABOUT THE TUBE AXIS): PIN 5, ±10°; SIDE TERMINAL (ON SAME SIDE OF TUBE AS PIN 5), ±10°. ANGLE BETWEEN DJ_1 – DJ_2 TRACE AND DJ_3—DJ_4 TRACE IS 90° ±1°.

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.

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5AHP7, 5AHP7-A
OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA

General:

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

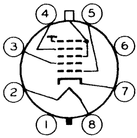
Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to all other electrodes. . . . . 6 μμf
- Cathode to all other electrodes. . . . . . 5 μμf

Faceplate, Spherical . . . . .Clear Glass

Phosphor (For curves, see front of this section).	*Type 5AHP7* P7	*Type 5AHP7-A* P7—Aluminized
Fluorescence . . .	Blue	Blue
Phosphorescence. .	Greenish-Yellow	Greenish-Yellow
Persistence. . .	Long	Long

Focusing Method. . . . . .Electrostatic
Deflection Method. Magnetic
Deflection Angle (Approx.) . . . . 53^{o}
Overall Length . . . . 11-1/8" ± 1/4"
Greatest Diameter of Bulb. . . . . 4-15/16" ± 3/32"
Minimum Useful Screen Diameter . . . . 4-1/4"
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 - Ultor (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.

RCA

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 µamp. . .	0% to 3.6% of E_{c5}	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-11% to -25.7% of E_{c2}	volts
Grid-No.4 Current.	-25 to +25	µamp
Grid-No.2 Current.	-15 to +15	µamp
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 µamp. . .	0 to 250	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected 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).

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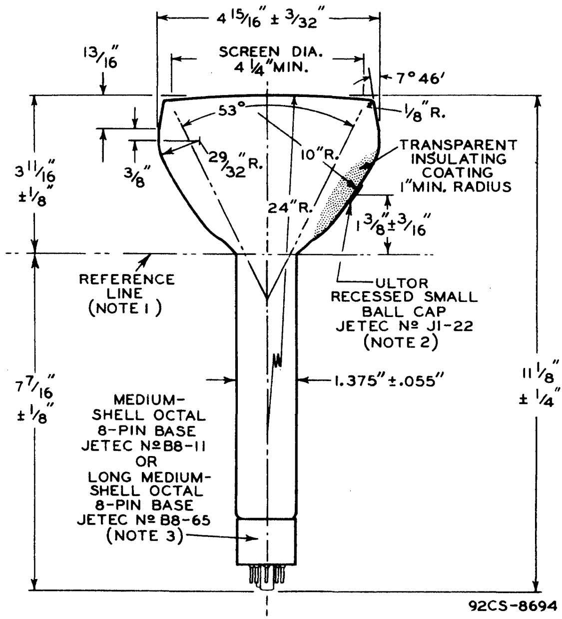
RCA

5AHP7, 5AHP7-A

OSCILLOGRAPH TUBE



92CS-8694

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. ULTOR TERMINAL IS ON SAME SIDE OF TUBE AS PIN 5.

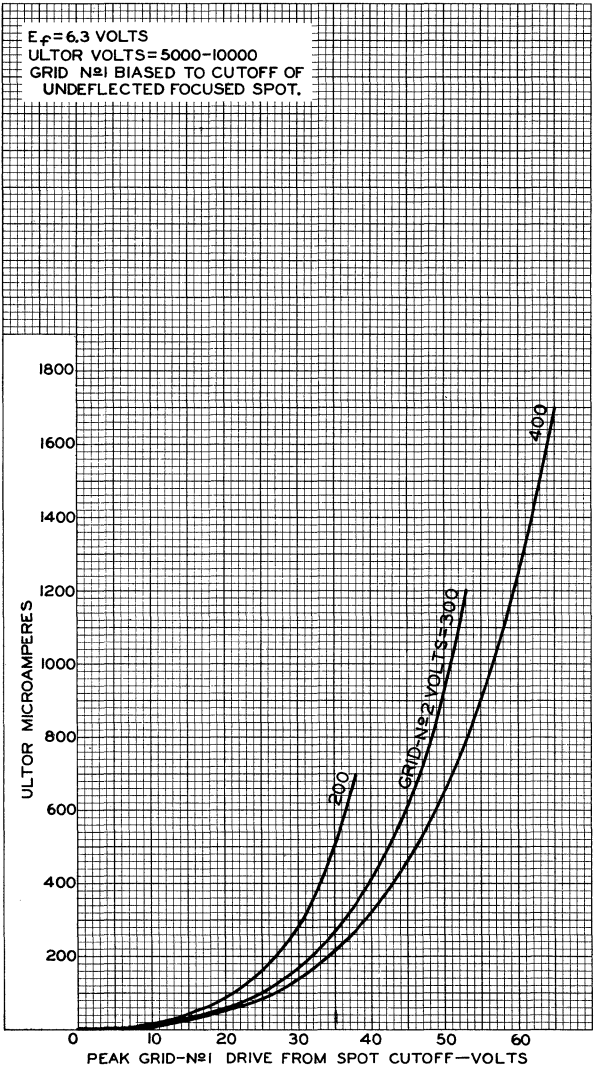
NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.430" + .003" - .000" I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: ℄ 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



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9088

RCA

5AUP24

COLOR FLYING-SPOT CATHODE-RAY TUBE

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

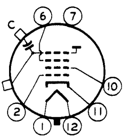
For use as flying-spot scanner in color video-signal generators

DATA

General:

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

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Grid No.3
Pin 7 - Internal Connection— Do Not Use
Pin 10 - Grid No.2



Pin 11 - Cathode
Pin 12 - Heater
Cap - Ultor (Grid No.4, Collector)
C - External Conductive Neck Coating

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	27000 max.	volts
GRID-No.3 VOLTAGE	6000 max.	volts
GRID-No.2 VOLTAGE	350 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	150 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

← Indicates a change.

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

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 volts

Grid-No.3 Voltage for focus with ultor current of 200 μa .	17% to 21.5% of E_{c4}	volts
Grid-No.2 Voltage when circuit design utilizes fixed grid-No.1 voltage (E_{c1}) for visual extinction of undeflected focused spot	2 to 5 times E_{c1}	volts
Grid-No.1 Voltage for visual extinction of undeflected focused spot when circuit design utilizes grid-No.2 voltage (E_{c2}) at fixed value	20% to 50% of E_{c2}	volts
Maximum Grid-No.3 Current for ultor current of 200 μa. . . .	170	μa
Grid-No.2 Current.	-15 to +15	μa

Examples of Use of Design Ranges:

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

Maximum Circuit Values:

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

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

→ OPERATING CONSIDERATIONS

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

→ Indicates a change.

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.

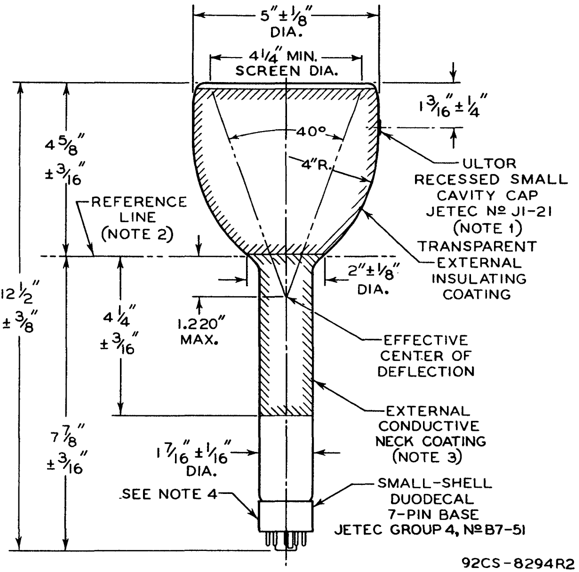
When in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data. It is also recommended that a series limiting resistance of 50,000 ohms be placed in both the ultor and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

RCA

5AUP24

COLOR FLYING-SPOT CATHODE-RAY TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION 3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION 3.

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

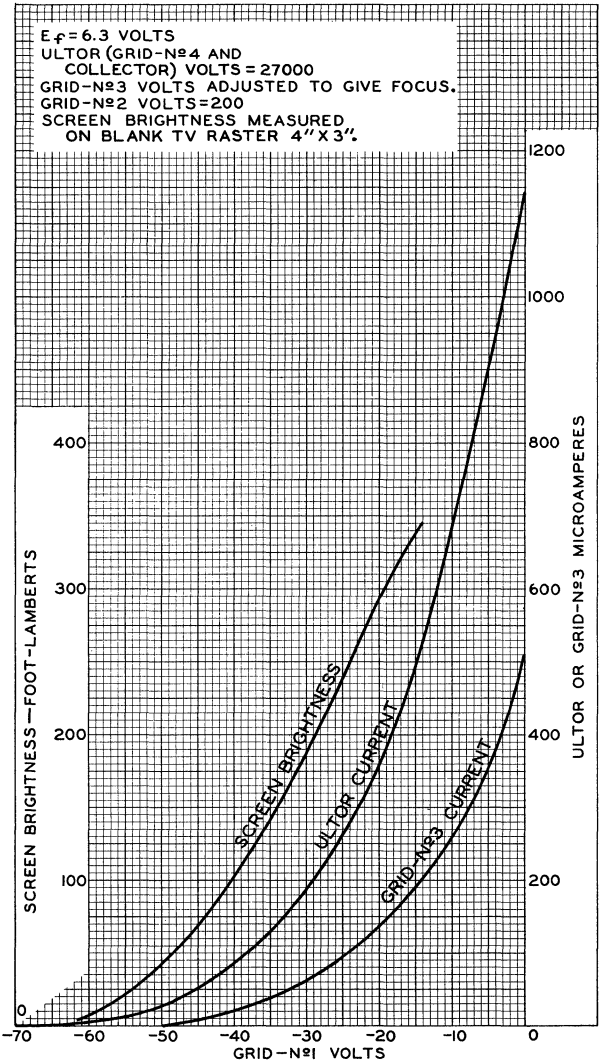
NOTE 3: EXTERNAL CONDUCTIVE NECK COATING MUST BE GROUNDED.

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

5AUP24

5AUP24

AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION
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92CM-8343R1

5AYP4
VIEW-FINDER KINESCOPE

METAL-BACKED SCREEN

ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

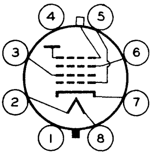
DATA

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	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor●	{750 max. / 500 min.	μμf / μμf
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_{c_4}) between 5000 and 10000 volts and grid-No.2 voltage (E_{c_2}) between 200 and 410 volts*

Grid-No.3 Voltage for Focus with Ultor Current of 100 μamp	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	μamp
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 μamp	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

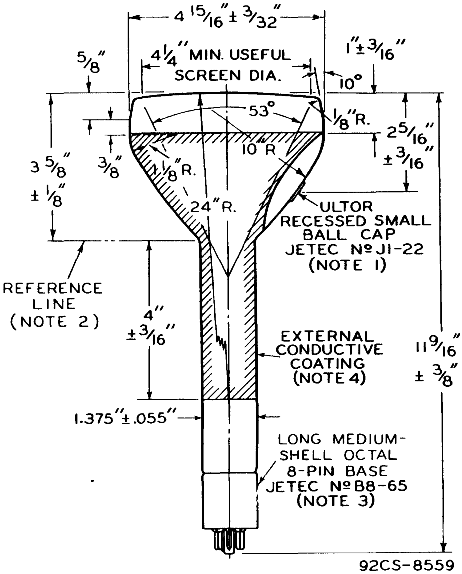
* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 5000 volts.

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

RCA

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 ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. ULTOR TERMINAL IS ON SAME SIDE OF TUBE AS PIN 5.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.430" + 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.

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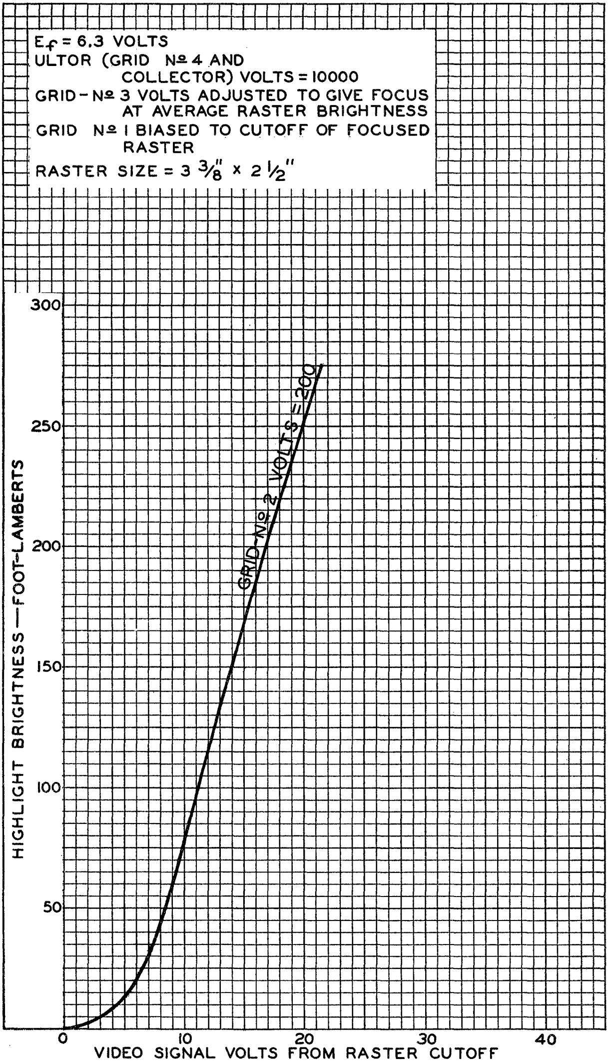
5AYP4

AVERAGE GRID-DRIVE CHARACTERISTIC



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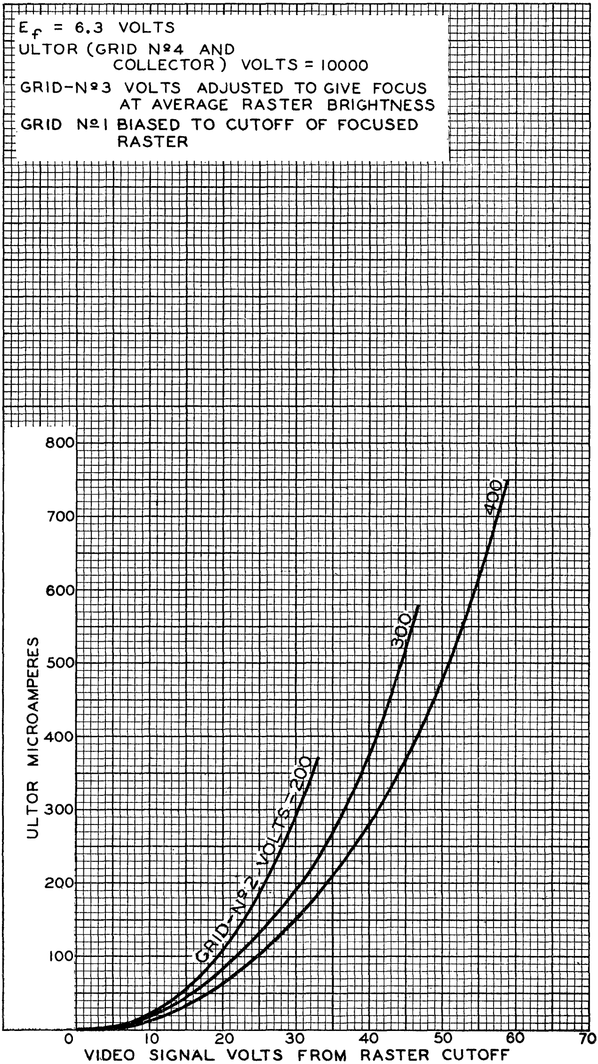
5AYP4

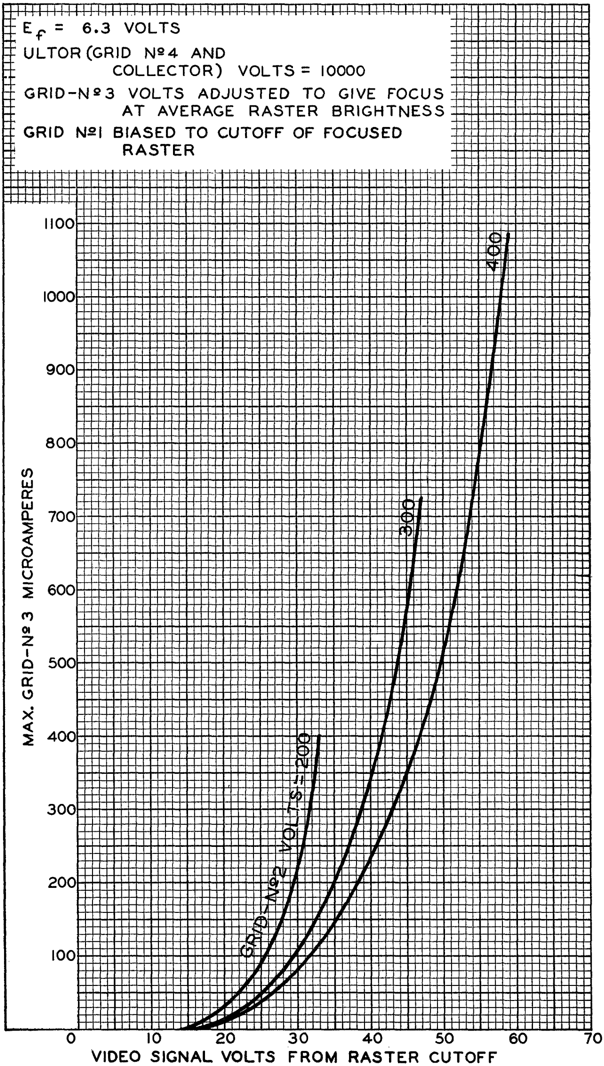
AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

5AYP4

AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

5AZP4

PROJECTION KINESCOPE

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

DATA

General:

Heater, for Unipotential Cathode:

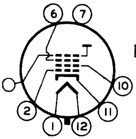
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes	8 max.	$\mu\mu$f
Cathode to all other electrodes	5	$\mu\mu$f

Faceplate, Spherical	Non-browning Glass
Refractive index	1.519
Phosphor (For curves, see front of this Section)	P4—Silicate Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Medium
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle (Approx.)	50°
Overall Length	12-3/16" ± 3/8"
Greatest Diameter of Bulb	5" ± 1/8"
Minimum Useful Screen Diameter	4-1/2"
Minimum Optical-Quality-Circle Diameter	4-1/4"
Weight (Approx.)	1-1/2 lbs
Mounting Position	Any
Ultor Lead	Molded-On Insulated Cable 48" Long
Bulb	J-40
Base	Small-Shell Duodecal 7-Pin (JETEC No.B7-51)
Basing Designation for BOTTOM VIEW	12AA

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Grid No.3
Pin 7 - Internal Connection-Do Not Use
Pin 10 - Grid No.2



Pin 11 - Cathode
Pin 12 - Heater
Flexible Cable - Ultor (Grid No.4, Collector)

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

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

Face Temperature	100 max.	$^{\circ}$C

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5AZP4

PROJECTION KINESCOPE

Maximum Ratings, *Absolute Values:*

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

Equipment Design Ranges:

For any ultor voltage (Ec_4) between 35000 and 40000 volts*

Grid-No.3 (Focusing Electrode) Voltage for ultor current of 300 μamp	18.5% to 22.5% of Ec_4	volts
Grid-No.2 Voltage when circuit design utilizes grid-No.1 voltage (Ec_1) at fixed value for raster cutoff	2.15 to 5.4 times Ec_1	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2 voltage (Ec_2) at fixed value	−18.5% to −46.5% of Ec_2	volts
Maximum Grid-No.3 Current for ultor current of 300 μamp	100	μamp
Grid-No.2 Current	−15 to +15	μamp

Examples of Use of Design Ranges:

For ultor voltage of 36000 volts

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

*: See next page.

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5AZP4

PROJECTION KINESCOPE

Maximum Circuit Values:

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

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 35000 volts.

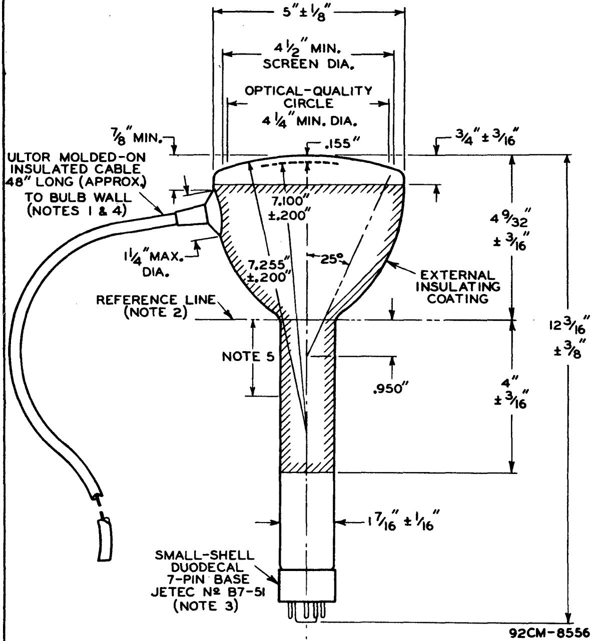
OPERATING CONSIDERATIONS

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

An *air-cooling system* is required to cool the face of the 5AZP4 when the tube is operated with an average ultor input in excess of 9 watts. The system consists of a suitable blower and air duct, having an outlet diameter of about 2 inches, directed perpendicularly onto the face of the tube. The air flow must be adequate to limit the faceplate temperature to 100°C. The cooling air must not contain water, dust, or other foreign matter. The air-cooling system should be electrically interconnected with the ultor power supply to prevent operation of the tube without cooling.

5AZP4

PROJECTION KINESCOPE



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5AZP4

PROJECTION KINESCOPE

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

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

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. SOCKET CONTACTS CORRESPONDING TO VACANT PIN POSITIONS No.3, 4, 5, 8, AND 9 SHOULD BE REMOVED IN ORDER TO PROVIDE MAXIMUM INSULATION FOR PINS No.6 AND 7.

NOTE 4: ULTOR CABLE SHOULD NOT BE SHARPLY BENT WITHIN 3" OF BULB WALL.

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

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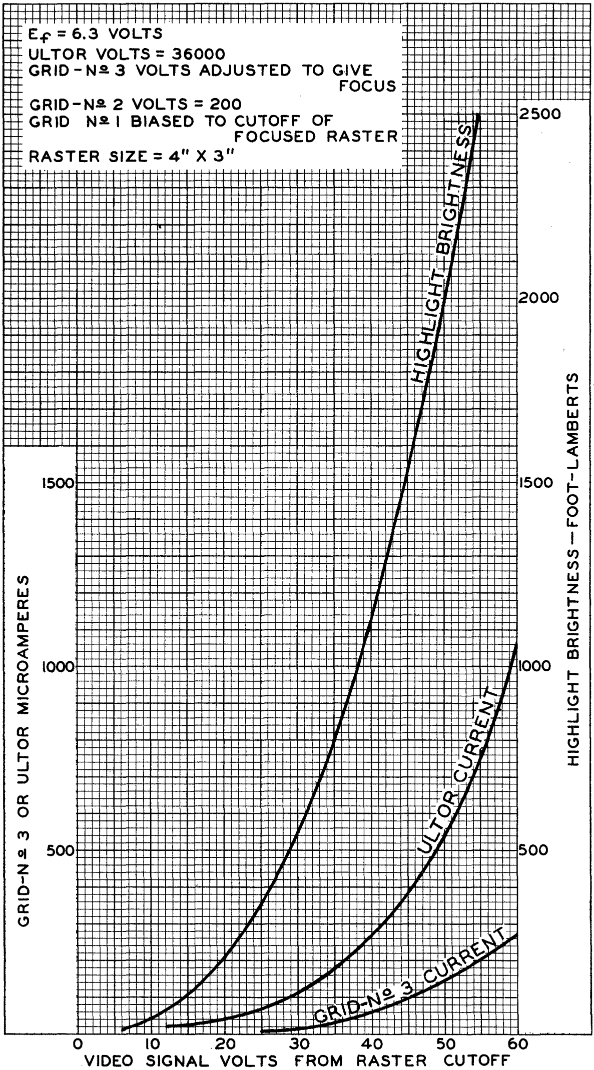
5AZP4

5AZP4

AVERAGE DRIVE CHARACTERISTICS



TUBE DIVISION
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92CM-8549

5BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 5BP1

General:

Heater, for Unipotential Cathode:

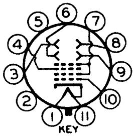
Voltage	6.3 ± *10%*	ac or dc volts
Current	0.6	amp.

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes	8.0	μμf
DJ_1 to DJ_2	1.3	μμf
DJ_3 to DJ_4	1.2	μμf
DJ_1 to All Other Electrodes	9.5	μμf
DJ_3 to All Other Electrodes	12.0	μμf
DJ_1 to All Other Electrodes except DJ_2	8.0	μμf
DJ_2 to All Other Electrodes except DJ_1	7.5	μμf
DJ_3 to All Other Electrodes except DJ_4	10.0	μμf
DJ_4 to All Other Electrodes except DJ_3	7.5	μμf

Phosphor (For Curves, see front of this Section)	No.1
Fluorescence	Green
Persistence	Medium
Focusing Method	Electrostatic
Deflection Method	Electrostatic
Overall Length	16-3/4" ± 3/8"
Greatest Diameter of Bulb	5-1/4" + 1/16" − 3/32"
Minimum Useful Screen Diameter	4-1/2"
Mounting Position	Any
Base	Medium Shell Magnal 11-Pin
Basing Designation for BOTTOM VIEW	11N

Pin 1 - Heater
Pin 2 - No Connection
Pin 3 — Deflecting Electrode DJ_1
Pin 4 - Anode No.1
Pin 5 - Internal Con. Do not use
Pin 6 - Deflecting Electrode DJ_4



Pin 7 - Anode No.2, Grid No.2
Pin 8 - Deflecting Electr. DJ_2
Pin 9 - Deflecting Electr. DJ_3
Pin 10 - Grid No.1
Pin 11 - Heater, Cathode

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

With DJ_1 positive with respect to DJ_2, the spot is deflected toward pin 4. With DJ_3 positive with respect to DJ_4, the spot is deflected toward pin 1.

The angle between the trace produced by DJ_3 and DJ_4 and its intersection with the plane through the tube axis and pin 1 does not exceed 10°.

The angle between the trace produced by DJ_3 and DJ_4 and the trace produced by DJ_1 and DJ_2 is 90° ± 3°.

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5BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

Maximum Ratings, ***Absolute Values*****:**

ANODE-No.2 & GRID-No.2 VOLTAGE.	2200 *max.*	volts
ANODE-No.1 VOLTAGE.	1100 *max.*	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative Value.	125 *max.*	volts
Positive Value.	0 *max.*	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE	550 *max.*	volts

Typical Operation:

Anode-No.2 & Grid-No.2 Voltage* . .	1500	2000 . . .	volts
Anode-No.1 Volt. for Focus at 75% of Grid-No.1 Volt. for Cutoff● .	337	450 . . .	volts
Grid-No.1 Volt. for Visual Cutoff#.	-30	-40 . . .	volts
Max. Anode-No.1 Current Range▲.	Between -50 and +10		µamp.
Deflection Sensitivity:			
DJ_1 and DJ_2	0.404	0.303 . .	mm/v dc
DJ_3 and DJ_4	0.446	0.334 . .	mm/v dc
Deflection Factor:**			
DJ_1 and DJ_2	63	84 . .	v dc/in.
DJ_3 and DJ_4	57	76 . .	v dc/in.

* Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 1500 volts.

● Individual tubes may require between +25% and -30% of the values shown with grid-No.1 voltages between zero and cutoff.

\# Visual extinction of stationary focused spot. Supply should be adjustable to ± 50% of these values.

▲ See curve for average values.

** Individual tubes may vary from these values by ± 17%.

Spot Position:

The undeflected focused spot will fall within a 15-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ_1 and DJ_2. Suitable test conditions are: anode-No.2 voltage, 1500 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 megohm each, connected to anode-No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

Maximum Circuit Values:

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

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

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5CP1-A

OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

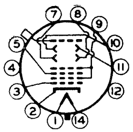
Voltage	6.3	ac or dc volts
Current	0.6	amp

Direct Interelectrode Capacitances (Approx.):

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

Phosphor (For Curves, see front of this Section)	P1
Fluorescence and Phosphorescence	Green
Persistence of Phosphorescence	Medium
Focusing Method	Electrostatic
Deflection Method	Electrostatic
Overall Length	16-3/4" ± 3/8"
Greatest Diameter of Bulb	5-1/4" ± 3/32"
Minimum Useful Screen Diameter	4-1/2"
Mounting Position	Any
Cap	Recessed Small Ball (JETEC No.J1-22)
Base	Medium-Shell Diheptal 12-Pin (JETEC No.B12-37)
Basing Designation for BOTTOM VIEW	$14J_1$

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



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

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

With DJ_1 positive with respect to DJ_2, the spot is deflected toward pin 5. With DJ_3 positive with respect to DJ_4, the spot is deflected toward pin 2.

The plane through the tube axis and each of the following items may vary from the trace produced by DJ_1 and DJ_2 by the following angular tolerances measured about the tube axis: Pin 5, 10^o; Cap (on same side of tube as pin 5), 10^o.

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

5CP1-A

5CP1-A
OSCILLOGRAPH TUBE

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

ANODE-No.3 VOLTAGE	4000 max.	volts
ANODE-No.2* VOLTAGE.	2000 max.	volts
RATIO OF ANODE-No.3 VOLTAGE TO ANODE-No.2 VOLTAGE . . .	2:3 : 1	
ANODE-No.1 VOLTAGE	1000 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	200 max.	volts
Positive bias value●	0 max.	volts
Positive peak value.	2 max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	125 max.	volts

Equipment Design Ranges:

*For any anode-No.3 voltage (Eb_3) between 2000** and 4000 volts and any anode-No.2 voltage (Eb_2) between 1500▲ and 2000 volts*

→ Anode-No.1 Voltage	18.7 to 34.5% of Eb_2 . . .		volts
→ Grid-No.1 Voltage♦	1.5% to 4.5% of Eb_2 . . .		volts
Anode-No.1 Current of any Operating Condition . .	−15 to +10	. . .	μamp
Deflection Factors:			
	When $Eb_3 = 2 \times Eb_2$		
DJ_1 & DJ_2	39 to 53 v dc/in./kv of Eb_2		
DJ_3 & DJ_4	33 to 45 v dc/in./kv of Eb_2		
	When $Eb_3 = Eb_2$		
DJ_1 & DJ_2	31 to 42 v dc/in./kv of Eb_2		
DJ_3 & DJ_4	27 to 37 v dc/in./kv of Eb_2		
Spot Position.	##		

Examples of Use of Design Ranges:

For anode-No.3 voltage of. .	*2000*	*3000*	*4000*	*volts*
and anode-No.2 voltage of. .	*2000*	*1500*	*2000*	*volts*
→ Anode-No.1 Volt.	375 to 690	280 to 515	375 to 690	volts
→ Grid-No.1 Volt.♦	−30 to −90	−22.5 to −67.5	−30 to −90	volts
Deflection Factors:				
DJ_1 & DJ_2 . . .	62 to 84	59 to 80	78 to 106	□
DJ_3 & DJ_4 . . .	54 to 74	50 to 68	66 to 90	□

Maximum Circuit Values:

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

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

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5CP1-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.

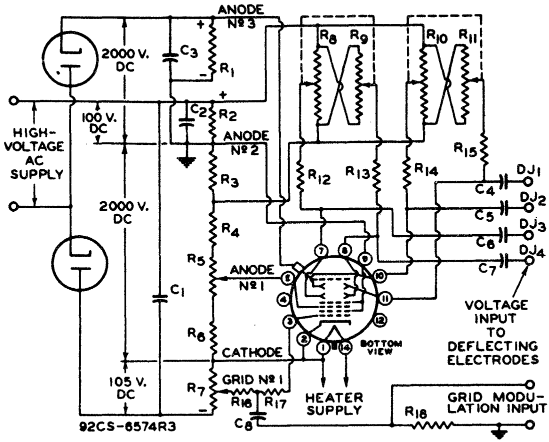
With heater voltage of 6.3 volts, anode-No.3 voltage of 4000 volts, anode-No.2 voltage of 2000 volts, anode-No.1 voltage adjusted to focus, grid-No.1 voltage adjusted to give spot that is just visible, each deflecting electrode connected through 1-megohm resistor to anode No.2, and tube shielded from 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.

5CP1-A

5CP1-A
OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



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

R5: 2-Megohm Potentiometer
R6: 1.5 Megohms, 0.5 Watt
R7: 0.5-Megohm Potentiometer
R8 R9: Dual 5-Megohm Potentiometer
R10 R11: Dual 5-Megohm Potentiometer
R12 R13 R14 R15: 2 Megohms, 0.5 Watt
R16: 0.5 Megohm, 0.5 Watt
R17: Not less than 2000 ohms per volt of positive signal
R18: 5 Megohms, 0.5 Watt

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

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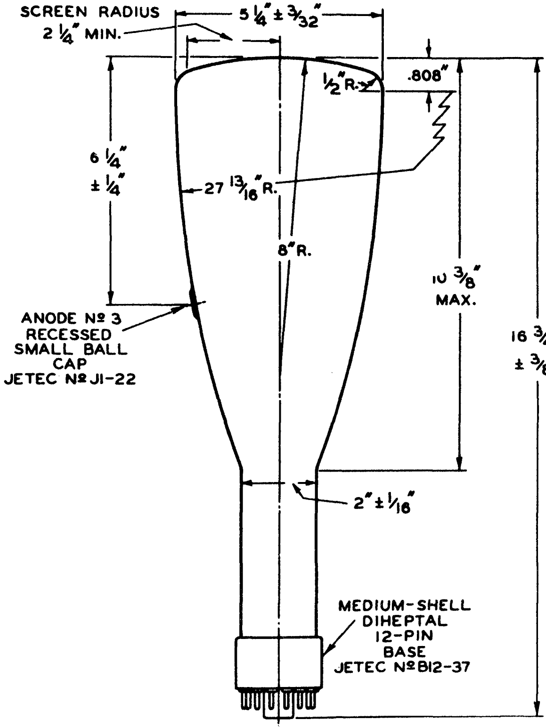
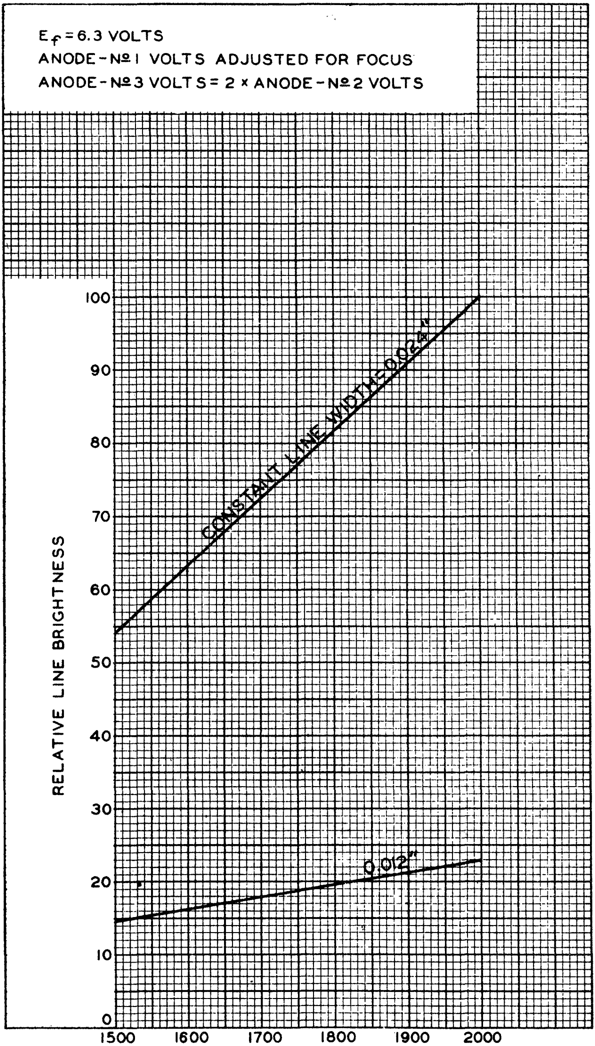
OSCILLOGRAPH TUBE



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

92CM-6408R4

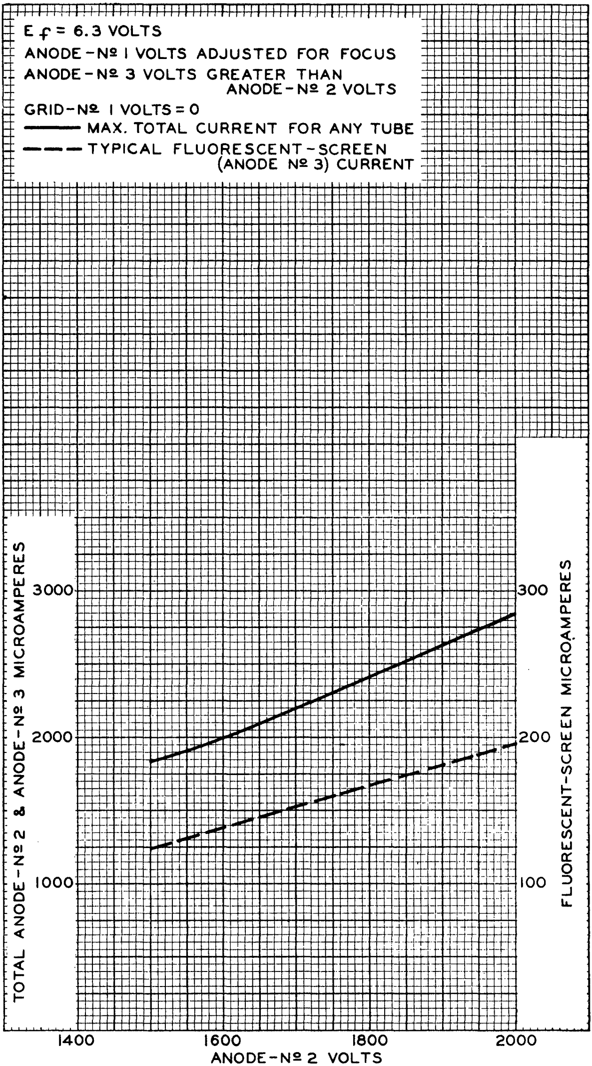
5CP1-A
CHARACTERISTICS



5CP1-A

5CP1-A

CHARACTERISTICS



DEC. 24, 1946

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92CM-6821

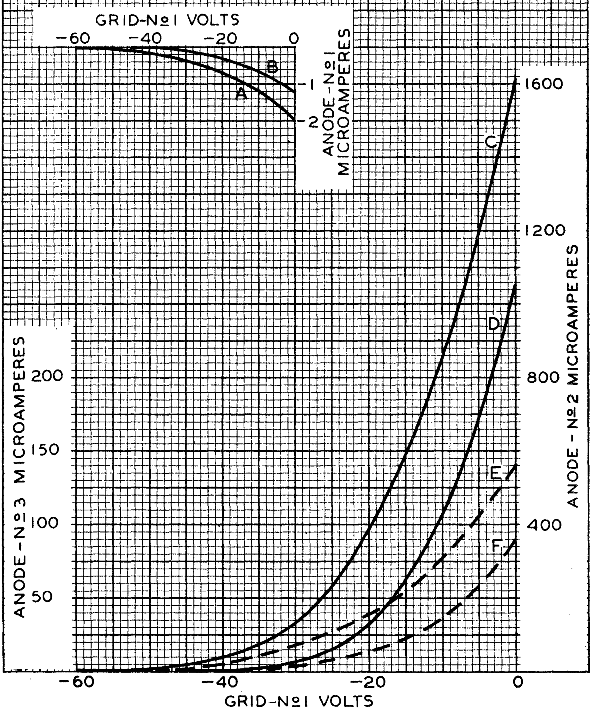
RCA

5CP1-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 No1	2000	2000-4000
B	ANODE No1	1500	1500-3000
C	ANODE No2	2000	4000
D	ANODE No2	1500	3000
E	ANODE No3	2000	4000
F	ANODE No3	1500	3000



RCA

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
OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

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

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

5CP12

OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

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

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

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

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

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

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5FP7-A

OSCILLOGRAPH TUBE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

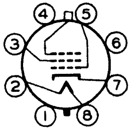
DATA

General:

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

BOTTOM VIEW

Pin 1 - No Connection
Pin 2 - Heater
Pin 3 - Grid No.2
Pin 4 - No Connection



Pin 5 - Grid No.1
Pin 6 - No Connection
Pin 7 - Cathode
Pin 8 - Heater
Cap - Anode

Maximum Ratings, *Design-Center Values*:

ANODE VOLTAGE	8000 max.	volts
GRID-No.2 VOLTAGE	700 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	180 max.	volts ←
Positive bias value*	0 max.	volts
Positive peak value	2 max.	volts
PEAK GRID-No.1 DRIVE FROM CUTOFF	65 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

Typical Operation:

Anode Voltage**	4000	7000	volts
Grid-No.2 Voltage	250	250	volts

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

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

← Indicates a change.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5FP7-A

5FP7-A

OSCILLOGRAPH TUBE

Grid-No.1 Voltage°	-25 to -70	-25 to -70	volts
→ Grid-No.2 Current.	-15 to +15	-15 to +15	μamp
Focusing-Coil Current			
→ (DC, approx.)#	96 ± 15%	128 ± 15%	ma
Spot Position.	##	—	

Maximum Circuit Values:

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

° For visual extinction of undeflected focused spot.

\# For specimen focusing coil similar to JETEC Focusing Coil No.106 positioned with air gap toward face plate, and center line of 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.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5FP14-A
OSCILLOGRAPH TUBE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

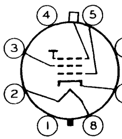
Heater, for Unipotential Cathode:
- Voltage . . . . 6.3 . . . . ac or dc volts
- Current . . . . 0.6 ± 10% . . . . amp

Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to all other electrodes . . . . . . 8 $\mu\mu$f
- Cathode to all other electrodes . . . . 5 $\mu\mu$f

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.

5FP14-A

5FP14-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 Undeflected Focused Spot	−10% to −28% of E_{c_2}	volts
Grid-No.2 Current	−15 to +15	μamp
Focusing-Coil Current (DC)oo	$\left[\sqrt{E_{c_3}/4000} \times 96\right] \pm 15\%$	ma
Spot Position	##	

Examples of Use of Design Ranges:

With ultor voltage of	*4000*	*5000*	*volts*
and grid-No.2 voltage of	*250*	*250*	*volts*
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	−25 to −70	−25 to −70	volts
Focusing-Coil Current (DC)	96 ± 15%	107 ± 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 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 center line of the tube face divided by the number of scanning lines (49).

TUBE DIVISION
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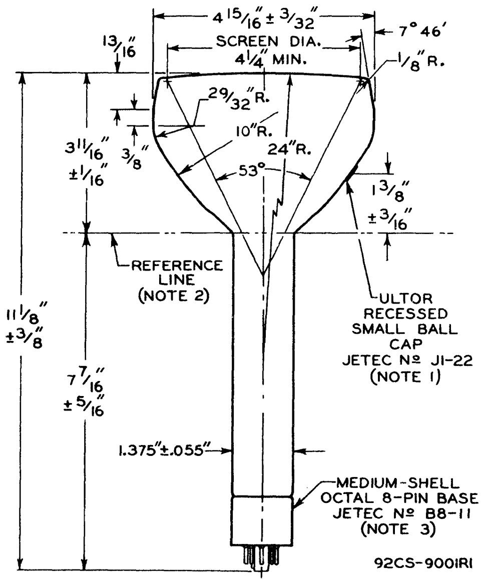
RCA

5FP14-A

OSCILLOGRAPH TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. ULTOR TERMINAL IS ON SAME SIDE OF TUBE AS PIN 5.

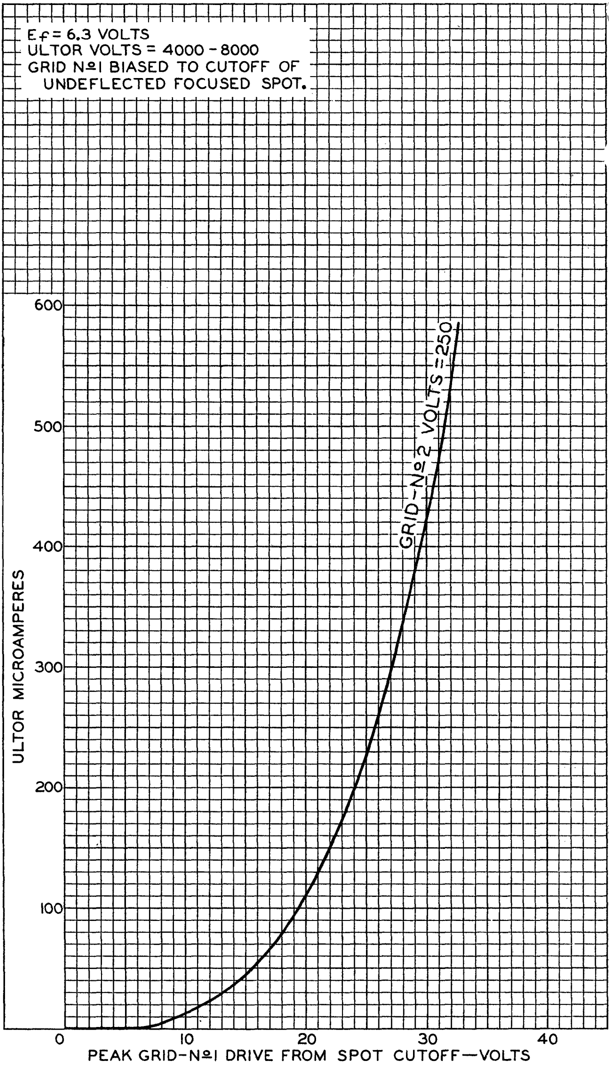
NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.430" + .003" - .000" I.D. AND 2" LONG WILL REST ON BULB CONE.

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

5FP14-A

5FP14-A

AVERAGE GRID-DRIVE CHARACTERISTIC



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9002

5FP15-A
OSCILLOGRAPH TUBE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

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

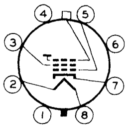
Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to all other electrodes . . . . . 8 μμf
- Cathode to all other electrodes . . . . . . 5 μμf

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

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

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

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



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

Maximum Ratings, *Design-Center Values:*

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

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

5FP15-A

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 Undeflected Focused Spot	-10% to -28% of E_{c2}	volts
Grid-No. 2 Current	-15 to +15	μamp
Focusing-Coil Current (DC)°° .	$\left[\sqrt{E_{c3}/4000} \times 96\right] \pm 15\%$	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 Undeflected Focused Spot	-25 to -70	-25 to -70	volts
Focusing-Coil Current (DC). .	82 to 110	91 to 123	ma

Maximum Circuit Values:

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

SPECIAL PERFORMANCE DATA

Line Width:

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

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

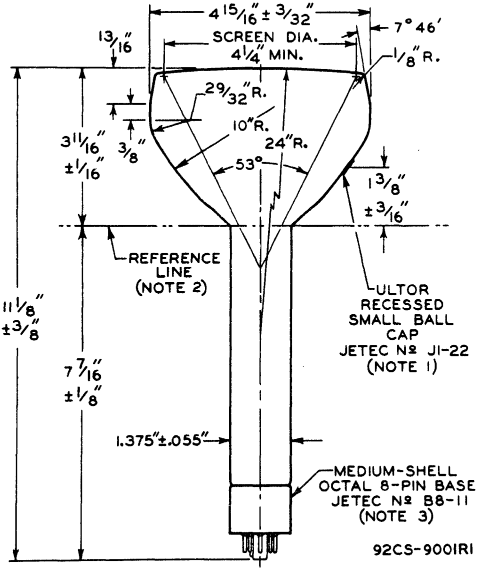
°° For specimen focusing coil similar to JETEC Focusing Coil No.106 positioned with air gap toward faceplate and center line of air gap 2-3/4" from Reference Line *(See Dimensional Outline)* and ultor current of 200 microamperes.

\## 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



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. ULTOR TERMINAL IS ON SAME SIDE OF TUBE AS PIN 5.

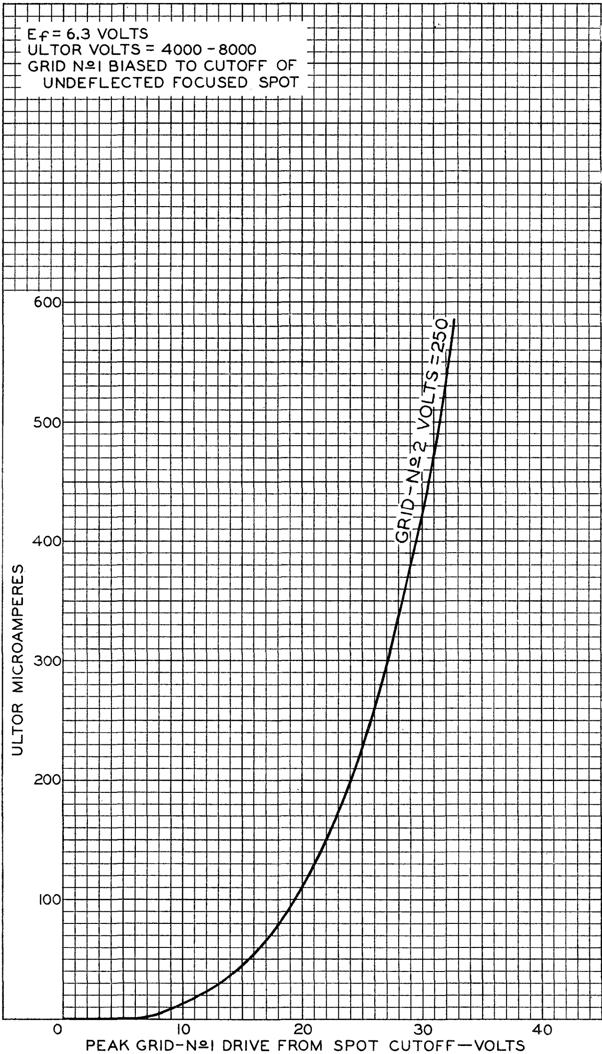
NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.430" + .003" – .000" I.D. AND 2" LONG WILL REST ON BULB CONE.

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

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5FP15-A

AVERAGE GRID-DRIVE CHARACTERISTIC



RCA

5TP4
PROJECTION KINESCOPE

ELECTROSTATIC FOCUS   MAGNETIC DEFLECTION

DATA

General:

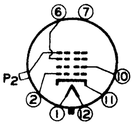
Heater, for Unipotential Cathode:
- Voltage . . . . 6.3 . . . . ac or dc volts
- Current . . . . 0.6 . . . . amp

Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to All Other Electrodes . . . . 7.5 . . . $\mu\mu f$
- Cathode to All Other Electrodes . . . . . 5.0 . . . $\mu\mu f$
- External Conductive Coating to Anode No.2 { 500 max. . $\mu\mu f$ / 100 min. . $\mu\mu f$ }

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" ± 3/8"
Greatest Diameter of Bulb . . . . 5" ± 1/8"
Minimum Useful Screen Diameter . . . . 4-1/2"
Minimum Optical-Quality-Circle Diameter . . . . 4-1/4"
Mounting Position . . . . Any
Cap . . . . Recessed Small Cavity
Base . . . . Small-Shell Duodecal 7-Pin
- Basing Designation for BOTTOM VIEW 12C

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Anode No.1
Pin 7 - Internal Con. - Do Not Use



Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater
Cap - Anode No.2

Maximum Ratings, *Design-Center Values*:

ANODE-No.2 VOLTAGE	27000 max.	volts
ANODE-No.1 VOLTAGE	6000 max.	volts
GRID-No.2 VOLTAGE	350 max.	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative bias value	150 max.	volts
Positive bias value	0 max.	volts ←
Positive peak value	2 max.	volts ←
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts ←
After equipment warm-up period	175 max.	volts ←
Heater positive with respect to cathode	10 max.	volts

Typical Operation:

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

* See next page.   ← Indicates a change.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5TP4

5TP4
PROJECTION KINESCOPE

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

Maximum Circuit Values:

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

→ **Minimum Circuit Values:**

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

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

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

Components:

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

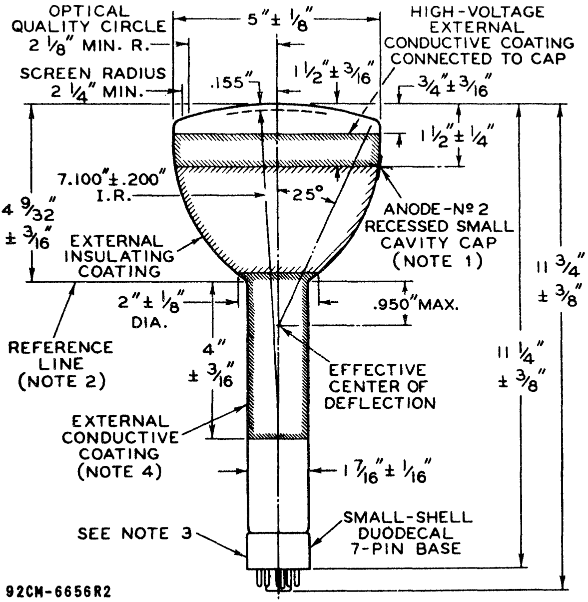
* Brilliance and definition decrease with decreasing anode voltages. In general, anode No.2 voltage should not be less than 20000 volts.

** Subject to variation of ±40% if it is desired to operate any tube at a grid-No.1 cutoff bias of -70 volts.

° Visual extinction of undeflected focused spot.

→ Indicates a change.

5TP4
PROJECTION KINESCOPE



92CM-6656R2

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.

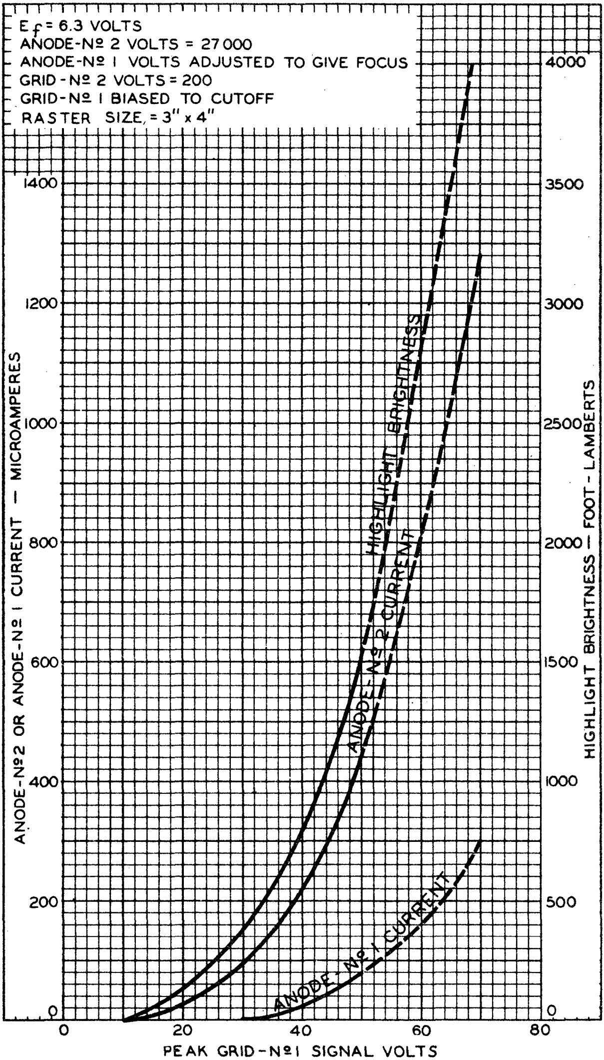
NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY.

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

5TP4

5TP4

AVERAGE CHARACTERISTICS



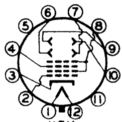
5UP1
OSCILLOGRAPH TUBE

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	$\mu\mu$f
DJ_1 to DJ_2	2.5	$\mu\mu$f
DJ_3 to DJ_4	2.5	$\mu\mu$f
DJ_1 to All Other Electrodes	11.0	$\mu\mu$f
DJ_2 to All Other Electrodes	8.0	$\mu\mu$f
DJ_3 to All Other Electrodes	7.0	$\mu\mu$f
DJ_4 to All Other Electrodes	8.0	$\mu\mu$f
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 2 - Grid No.1
Pin 3 - Cathode
Pin 4 - Anode No.1
Pin 5 - Internal Con. Do Not Use
Pin 6 - Deflecting Electrode DJ_3
Pin 7 - Deflecting Electrode DJ_4



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

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

With DJ_1 positive with respect to DJ_2, the spot is deflected toward pin 4. With DJ_3 positive with respect to DJ_4, the spot is deflected toward pin 1.

The angle between the trace produced by DJ_1 and DJ_2 and its intersection with the plane through the tube axis and pin 1 does not exceed 10°.

The angle between the trace produced by DJ_3 and DJ_4 and the trace produced by DJ_1 and DJ_2 is 90° ± 3°.

5UP1

5UP1
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	*1000*	*2000*	*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

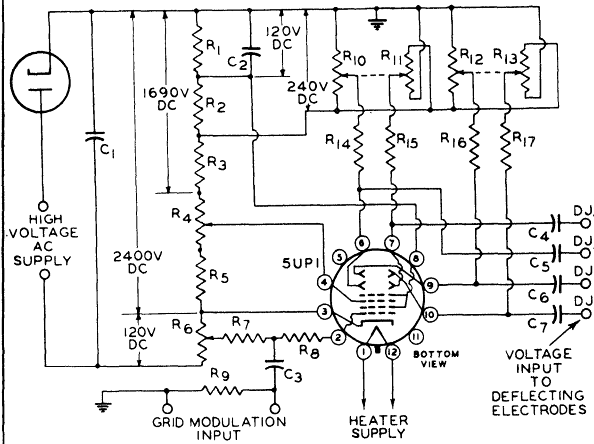
* Recommended minimum value.

□ 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.

5UPI
OSCILLOGRAPH TUBE

TYPICAL CIRCUIT



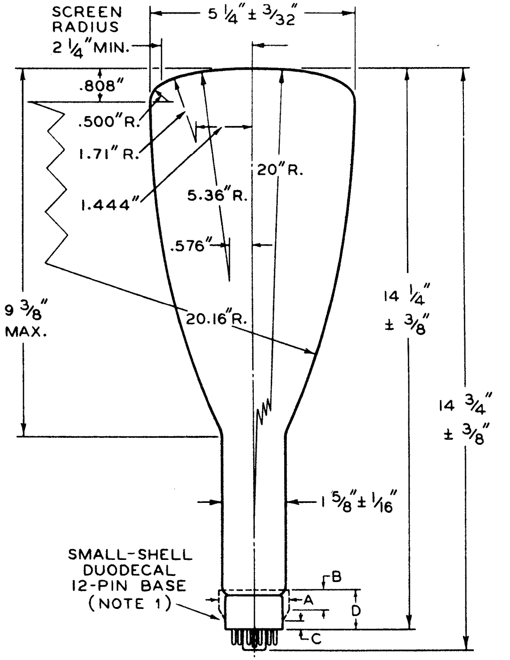
92CM-6819

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

5UP1

5UP1
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:

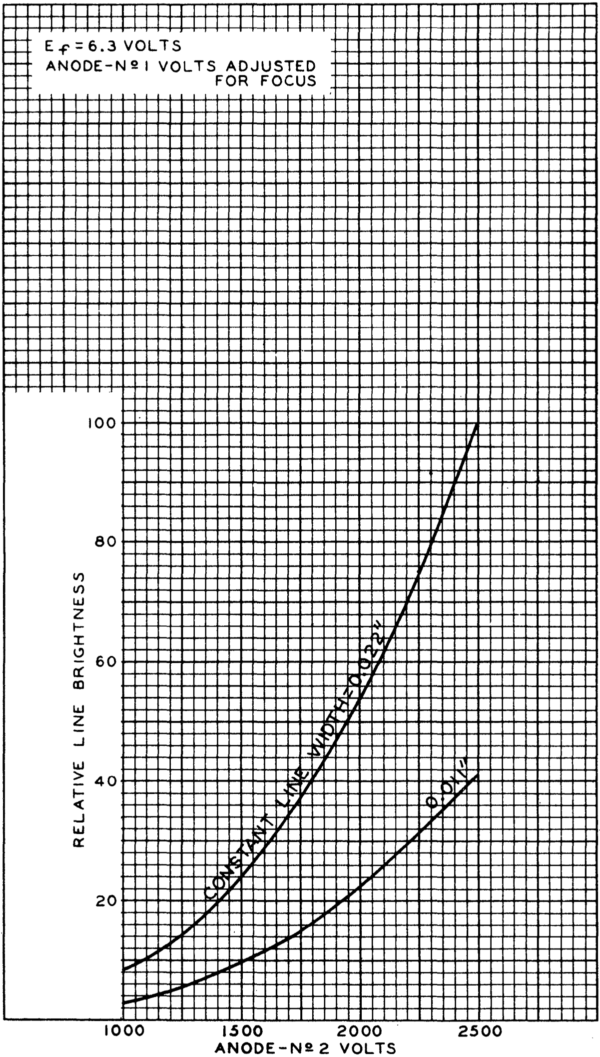
A = 1.85" MAX., B = 0.500", C = 0.200" MIN., D = 0.925".

92CM-6763

RCA

5UP1

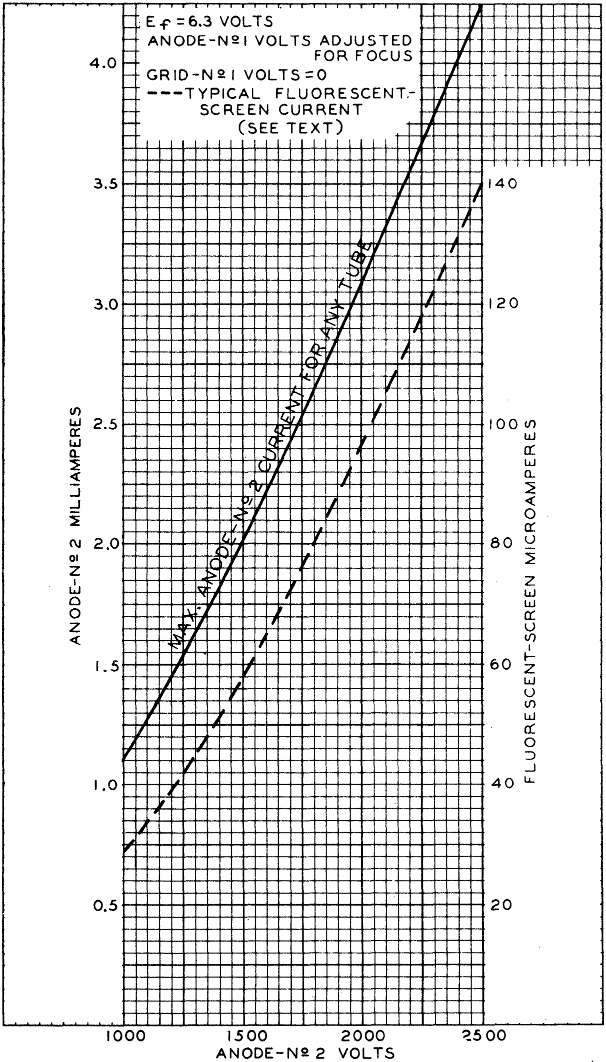
AVERAGE CHARACTERISTICS



5UP1

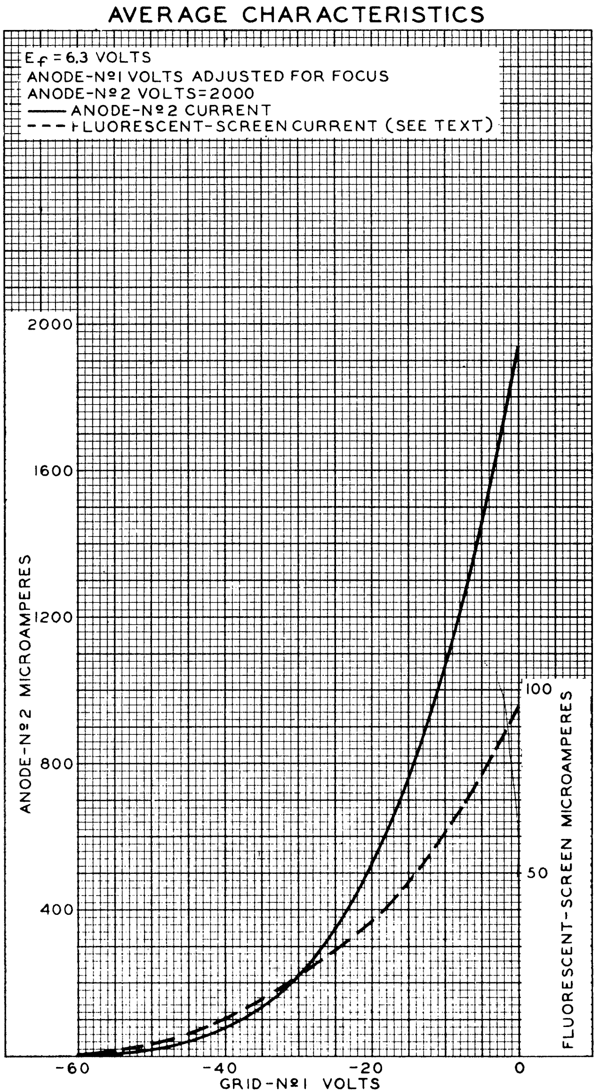
5UP1

CHARACTERISTICS



RCA

5UP1


AVERAGE CHARACTERISTICS
E_f = 6.3 VOLTS
ANODE-Nº1 VOLTS ADJUSTED FOR FOCUS
ANODE-Nº2 VOLTS=2000
——— ANODE-Nº2 CURRENT
- - - FLUORESCENT-SCREEN CURRENT (SEE TEXT)
2000
1600
1200
800
400
ANODE-Nº2 MICROAMPERES
100
50
FLUORESCENT-SCREEN MICROAMPERES
-60
-40
-20
0
GRID-Nº1 VOLTS

RCA

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

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

5WP11

5WP11

TRANSCRIBER KINESCOPE

ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

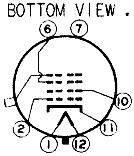
Voltage	6.3	ac or dc volts
Current	0.6	amp

Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes	7.5	$\mu\mu f$
Cathode to All Other Electrodes	5	$\mu\mu f$
External Conductive Coating to Anode No.2	500 max.	$\mu\mu f$
	100 min.	$\mu\mu f$

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" ± 3/8"
Greatest Diameter of Bulb	5" ± 1/8"
Minimum Useful Screen Diameter	4-1/4"
Raster Size (Approx.)	2-1/2" x 3-3/8"
Mounting Position	Any
Cap	Recessed Small Cavity
Base	Small-Shell Duodecal 7-Pin
Basing Designation for BOTTOM VIEW	12C

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Anode No.1
Pin 7 - Internal Con.- Do Not Use



Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater
Cap - Anode No.2

Maximum Ratings, *Design-Center Values*:

ANODE-No.2 VOLTAGE	27000 max.	volts
ANODE-No.1 VOLTAGE	6000 max.	volts
GRID-No.2 VOLTAGE	350 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	150 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

Typical Operation:

Anode-No.2 Voltage*	27000	volts

*: See next page.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

5WP11

TRANSCRIBER KINESCOPE

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

Maximum Circuit Values:

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

Minimum Circuit Values:

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

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

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

Components:

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

* Brilliance and definition decrease with decreasing anode voltages. In general, anode-No.2 voltage should not be less than 15000 volts.

** Subject variation of ± 40% when grid-No.1 voltage cutoff is desired at -70 volts.

OPERATING NOTES

Soft x-rays are produced when the 5WP11 is operated with an anode-No.2 voltage above approximately 20000 volts. These rays can constitute a health hazard unless the tube is adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

Resolution of better then 700 lines at the center of the reproduced picture can be produced by the 5WP11. To utilize such resolution capability in the horizontal direction with the standard scanning rate of 525 lines, it is necessary to use a video amplifier having a band-width of at least 10 megacycles.

5WP11

5WP11

TRANSCRIBER KINESCOPE

The screen of the 5WP11 has highly actinic blue radiation, and is particularly effective for photography. The presistence of the radiation is sufficiently short to prevent "carry over" from one frame to the next. The persistence is dependent to some extent on the current density in the focused spot, and decreases with current density.

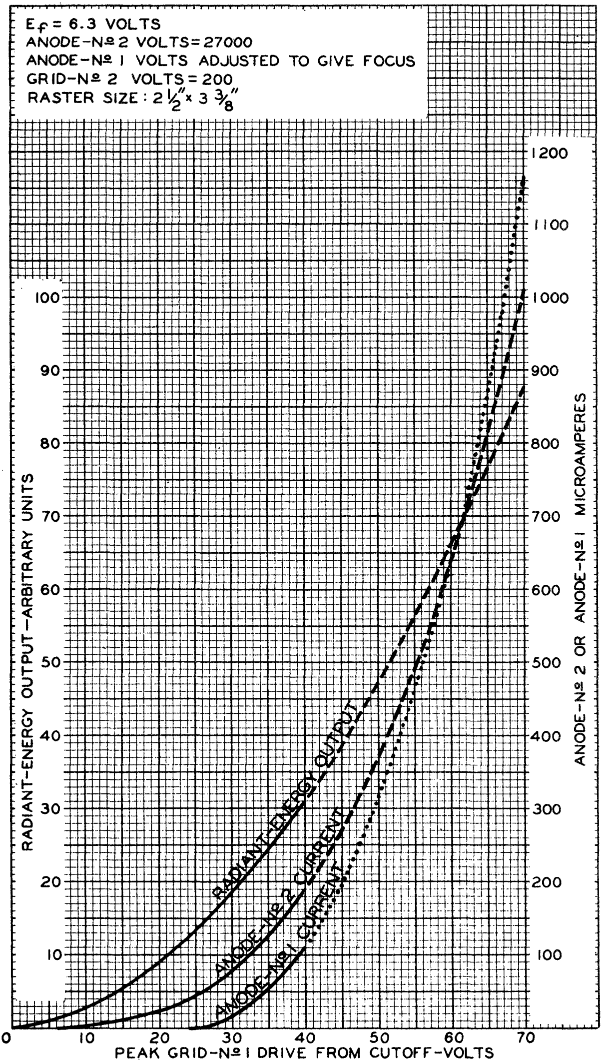
Operation of the 5WP11 results in gradual browning of the face. The rate of browning increases markedly with increase in anode-No.2 voltage, is proportional to beam current, and is inversely proportional to the scanned area. The browning is most noticeable during initial operation; thereafter, a gradual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

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

5WP11

5WP11

AVERAGE CHARACTERISTICS



5WP15

FLYING-SPOT CATHODE-RAY TUBE

ALUMINIZED SCREEN

ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

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

DATA

General:

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

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . . . . 8 μμf
- Cathode to all other electrodes . . . . 5 μμf
- External conductive neck coating to ultor . . {500 max. μμf; 100 min. μμf}

Faceplate, Flat . . . . Clear Glass

Phosphor (For curves, see front of this Section) . . . . P15 Aluminized

Fluorescence—
- Visible radiation . . . . Green
- Invisible radiation . . . . Near Ultraviolet

Phosphorescence—
- Persistence of visible radiation . . . . Short
- Persistence of invisible radiation . . . . Very Short

Focusing Method . . . . Electrostatic

Deflection Method . . . . Magnetic

Deflection Angle (Approx.) . . . . 50°

Tube Dimensions:
- Overall length . . . . 11-7/16" ± 3/8"
- Greatest diameter of bulb . . . . 5" ± 1/8"

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

Weight (Approx.) . . . . 1-1/2 lbs

Operating Position . . . . Any

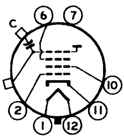
Cap . . . . Recessed Small Cavity (JETEC No.J1-21)

Socket . . . . *See Operating Considerations*

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

Basing Designation for BOTTOM VIEW 12C

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Grid No.3
Pin 7 - Internal Connection— Do Not Use
Pin 10 - Grid No.2
Pin 11 - Cathode



Pin 12 - Heater
Cap - Ultor (Grid No.4, Collector)
C - External Conductive Neck Coating

Maximum Ratings, *Design-Center Values:*

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

← Indicates a change.

RCA

5WP15

FLYING-SPOT CATHODE-RAY TUBE

GRID-No.1 VOLTAGE:		
Negative bias value.	150 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
→ After equipment warm-up period	150 max.	volts
→ Heater positive with respect to cathode.	150 max.	volts

→ Equipment Design Ranges:

For any ultor voltage (E_{c4}) between 15000 and 27000 volts*

Grid-No.3 Voltage for focus with ultor current of 150 µa 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 µa . .	200	µa
Grid-No.2 Current	-15 to +15	µa

→ Examples of Use of Design Ranges:

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

Maximum Circuit Values:

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

*: See next page. → Indicates a change.

5WP15

FLYING-SPOT CATHODE-RAY TUBE

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

OPERATING CONSIDERATIONS

X-Ray Warning. X-ray radiation is produced at the face of the 5WP15 when it is operated at its normal ultor voltage. These rays can constitute a health hazard, unless the tube is adequately shielded for X-ray radiation. Although relatively simple shielding should prove adequate, make sure that it provides the required protection against personal injury.

The *base pins* of the 5WP15 fit the Duodecal 12-contact socket. The socket contacts corresponding to the vacant pin positions (pin positions 3,4,5,8, and 9) should be removed in order to provide the maximum insulation for the high-voltage pins 6 and 7. The socket should be made of high-grade, arc-resistant, insulating material and should preferably be designed with baffles.

Resolution of better than 800 lines at the center of the reproduced picture can be produced by the 5WP15 when it is operated with 27,000 volts on the ultor. At lower ultor voltages, the resolution capability decreases. To obtain high resolution in the horizontal direction, it is necessary to use a video amplifier having a bandwidth of about 20 megacycles.

The *screen* of the 5WP15 has radiation in the visible green region and in the invisible near-ultraviolet region. The frequency response of the ultraviolet radiation is substantially constant for a range of 3 megacycles and then decreases exponentially toward zero at approximately 100 megacycles.

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

Care should be taken to avoid under-scanning over a protracted period because such an underscanned area will be burned and thus give diminished radiation when the raster is scanned to full size and be apparent in the reproduced picture. Furthermore, it is inadvisable to permit a modulated stationary pattern to remain more than a few minutes on the face of the tube. If it remains for a longer time, the face will be burned unevenly over the pattern area. When a modulated stationary pattern is used, it is recommended that the ultor current be limited to an instantaneous value of about 150 microamperes.

← indicates a change.

5WP15

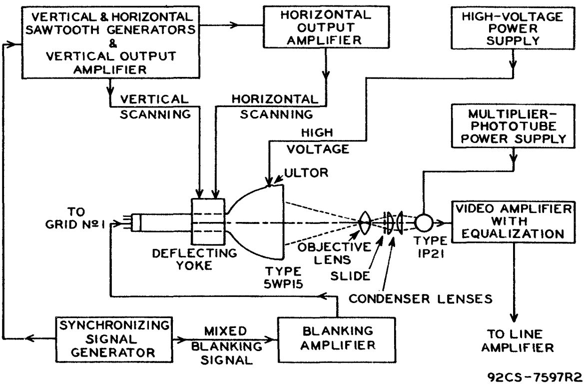
RCA

5WP15

FLYING-SPOT CATHODE-RAY TUBE

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

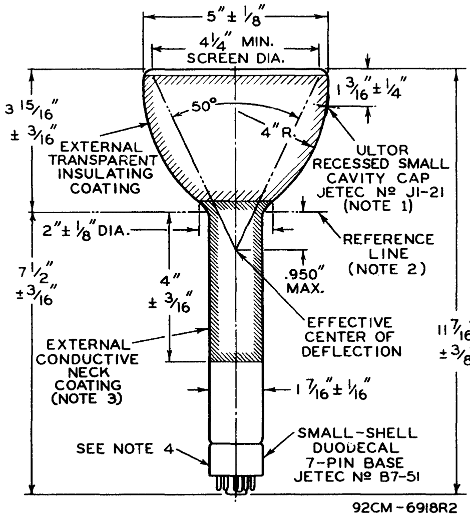
BLOCK DIAGRAM OF FLYING-SPOT VIDEO-SIGNAL GENERATOR SYSTEM FOR SLIDE TRANSPARENCIES



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.

5WP15

FLYING-SPOT CATHODE-RAY TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION 3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. THE ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION 3.

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

NOTE 3: EXTERNAL CONDUCTIVE NECK COATING MUST BE GROUNDED.

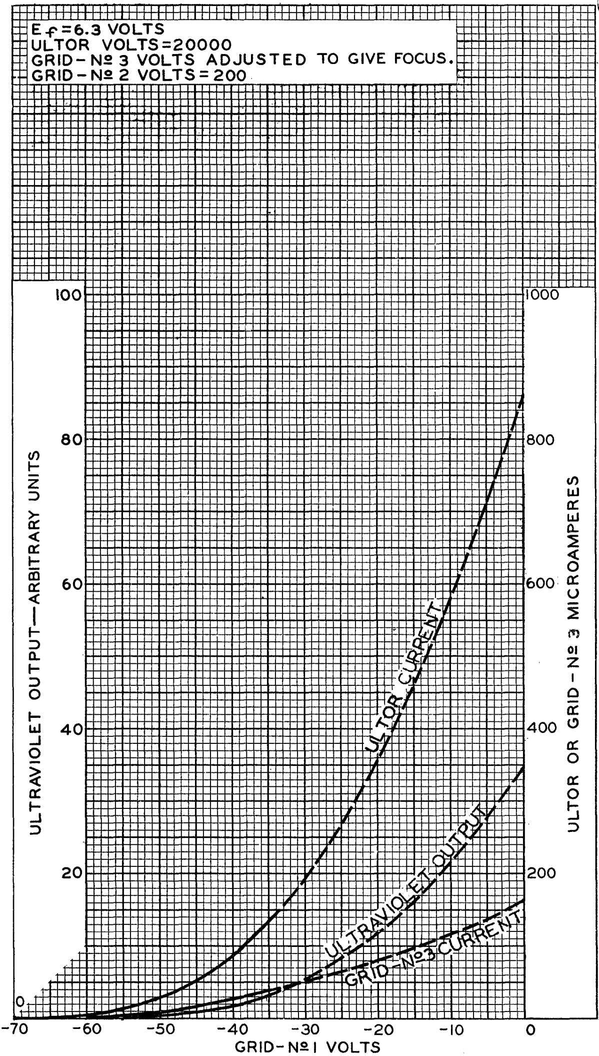
NOTE 4: ℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

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

5WP15

5WP15

AVERAGE CHARACTERISTICS



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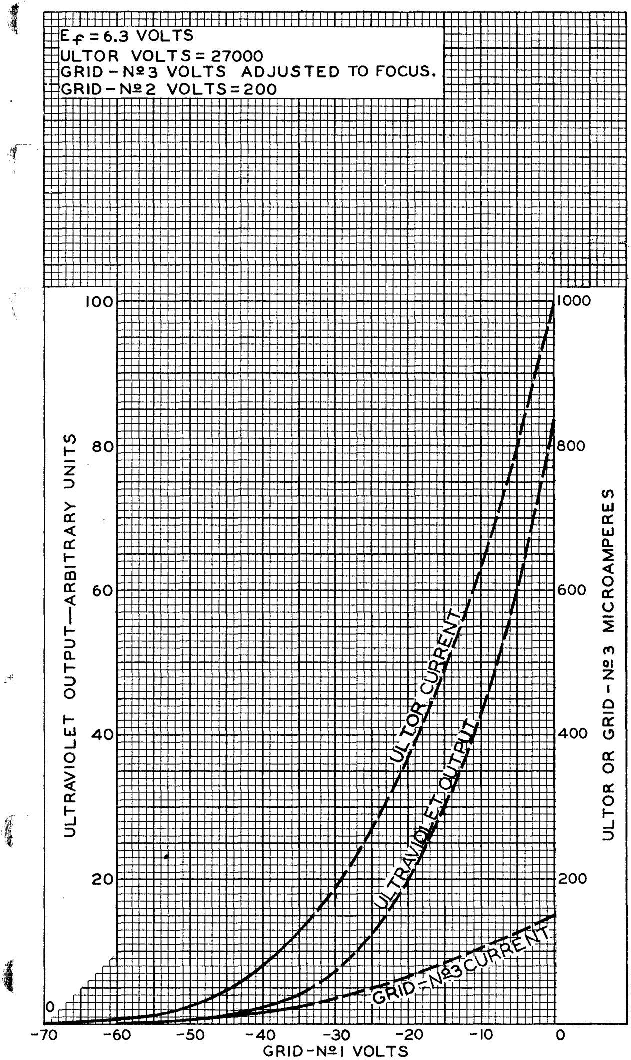
92CM-6916R1

5WP15

5WP15

AVERAGE CHARACTERISTICS



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

92CM-6917R1

5ZP16

FLYING-SPOT CATHODE-RAY TUBE

HIGH RESOLUTION CAPABILITY — ALUMINIZED SCREEN
ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

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

DATA

General:

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

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . . . 8 $\mu\mu$f
- Cathode to all other electrodes . . . . . . 5 $\mu\mu$f
- External conductive neck coating to ultor . . {500 max. $\mu\mu$f / 100 min. $\mu\mu$f}

Faceplate, Flat . . . . Clear Glass
Phosphor (For curves, see front of this Section) P16
Aluminized

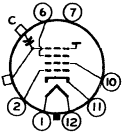
Fluorescence—
- Visible radiation . . . . Violet
- Invisible radiation . . . . Near Ultraviolet

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 Coating

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	27000 max.	volts
GRID-No.3 VOLTAGE	7000 max.	volts
GRID-No.2 VOLTAGE	350 max.	volts

← Indicates a change.

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

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5ZP16

FLYING-SPOT CATHODE-RAY TUBE

GRID-No.1 VOLTAGE:		
Negative bias value.	150 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts

Equipment Design Ranges:

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

Grid-No.3 Voltage for focus with ultor current of 25 µa or less.	20.5% to 26.5% of E_{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_{c_1}	volts
Grid-No.1 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed grid-No.2 voltage.	-20% to -50% of E_{c2}	volts
Grid-No.2 Current.	-15 to +15	µa

Examples of Use of Design Ranges:

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

Maximum Circuit Values:

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

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

→ Indicates a change.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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.

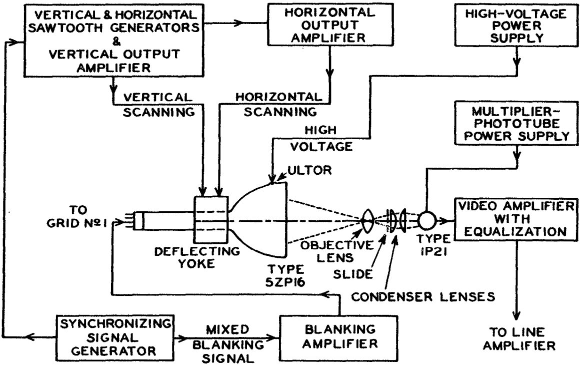
← Indicates a change.

RCA

5ZP16

FLYING-SPOT CATHODE-RAY TUBE

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

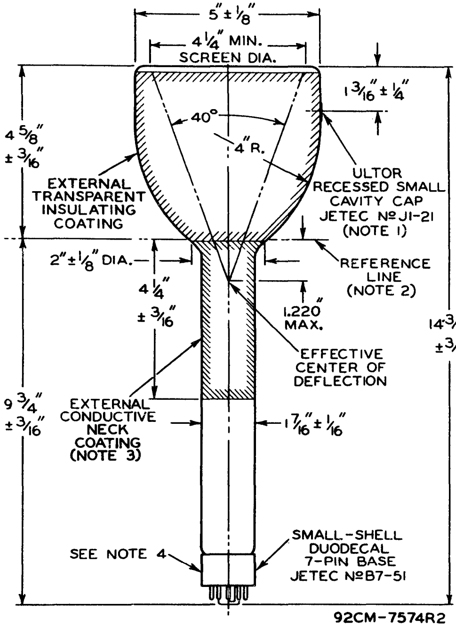


92CS-7597R2

RCA

5ZP16

FLYING-SPOT CATHODE-RAY TUBE



92CM-7574R2

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION 3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. THE ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION 3.

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

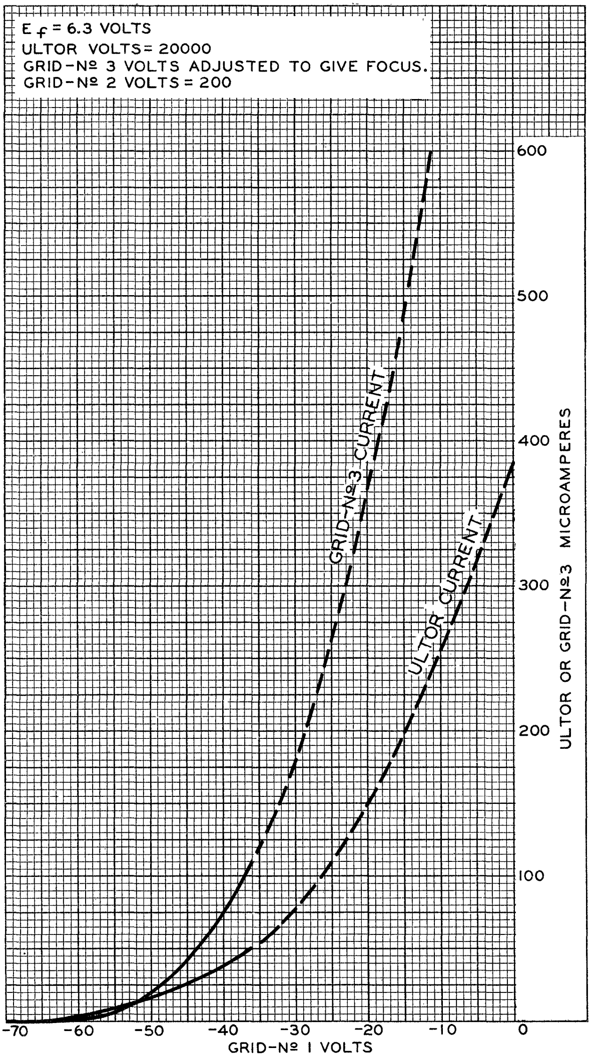
NOTE 3: EXTERNAL CONDUCTIVE NECK COATING MUST BE GROUNDED.

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

5ZP16

5ZP16

AVERAGE CHARACTERISTICS

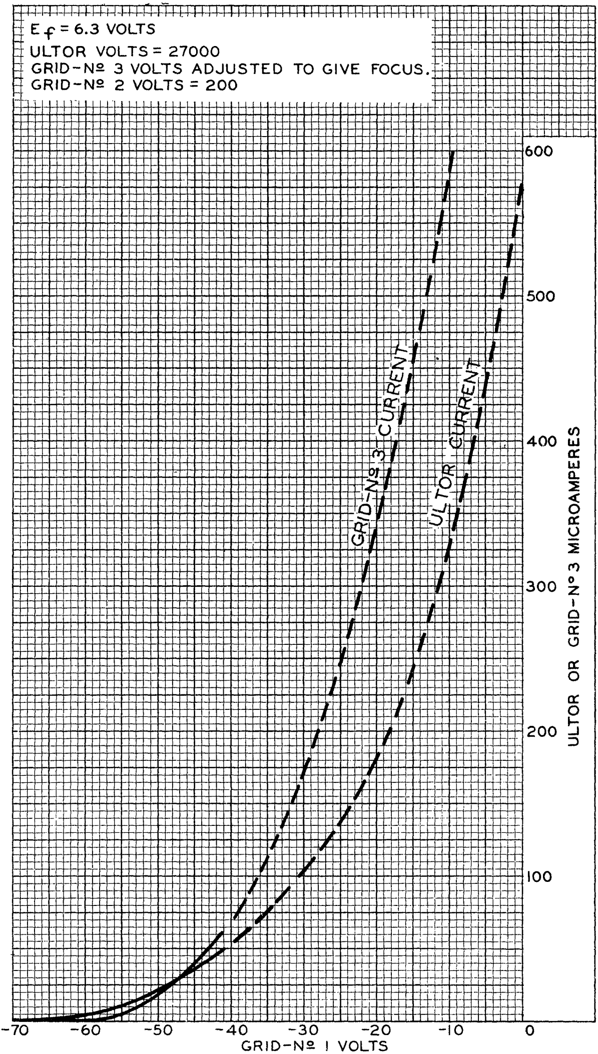


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7575R1

5ZP16

AVERAGE CHARACTERISTICS



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

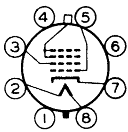
Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to All Other Electrodes . . . . 8.5 $\mu\mu f$
- Grid No.2 to All Other Electrodes . . . . 7 $\mu\mu f$
- Cathode to All Other Electrodes . . . . 5 $\mu\mu f$

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" ± 3/8"
Greatest Diameter of Bulb . . . . 7" ± 1/8"
Maximum Useful Screen Diameter . . . . 6"
Mounting Position . . . . Any
Cap . . . . Recessed Small Ball
Base . . . . Long Medium-Shell Octal 8-Pin

BOTTOM VIEW

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



Pin 6 - No Connection
Pin 7 - Cathode
Pin 8 - Heater

Cap - Anode, Grid No.3

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

ANODE● VOLTAGE	8000 max.	volts
GRID-No.2 VOLTAGE	700 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value□	0 max.	volts
Positive peak value	2 max.	volts
PEAK GRID-No.1 DRIVE FROM CUTOFF	65 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	125 max.	volts

Typical Operation:

Anode Voltage*	4000	7000	volts
Grid-No.2 Voltage	250	250	volts
Grid-No.1 Voltage Range○ . . .	-25 to -70	-25 to -70	volts
Focusing-Coil Current▲ . . .	75 to 102	99 to 135	ma
Spot Position	#	-	

●, □, *, ○, ▲, #: See next page.

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 reference line (see Outline Drawing); and total anode current of 200 microamperes.

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

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7JP4

7JP4

PICTURE TUBE

ROUND GLASS TYPE

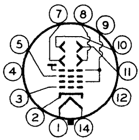
ELECTROSTATIC FOCUS — ELECTROSTATIC DEFLECTION

DATA

General:

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

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



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

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	6000 max.	volts
GRID-No.3 (FOCUSING) VOLTAGE	2800 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	200 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
PEAK VOLTAGE BETWEEN ULTOR AND ANY DEFLECTING ELECTRODE	750 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

← Indicates a change.

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

RCA

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.

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

7MP7

OSCILLOGRAPH TUBE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

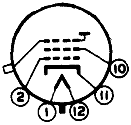
DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to All Other Electrodes	6	μμf
Cathode to All Other Electrodes	5	μμf
Phosphor (For Curves, see front of this Section)		P7
Fluorescence		Blue
Phosphorescence		Greenish-Yellow
Persistence		Long
Focusing Method		Magnetic
Deflection Method		Magnetic
Deflection Angle (Approx.)		50°
Overall Length		12-3/4" ± 3/8"
Greatest Diameter of Bulb		7-3/16" ± 1/8"
Minimum Useful Screen Diameter		6"
Mounting Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Base		Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

BOTTOM VIEW

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



Pin 11 - Cathode
Pin 12 - Heater
Cap - Grid No.3, Collector

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

Ultor● VOLTAGE	8000 max.	volts
GRID-No.2 VOLTAGE:		
Positive Value (DC or Peak AC)	700 max.	volts
Negative Value (DC or Peak AC)	180 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	180 max.	volts
Positive bias value#	0 max.	volts
Positive peak value	2 max.	volts
PEAK GRID-No.1 DRIVE FROM CUTOFF	65 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

● In the 7M-types, grid No.3 which has the ultor function, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

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

RCA

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.

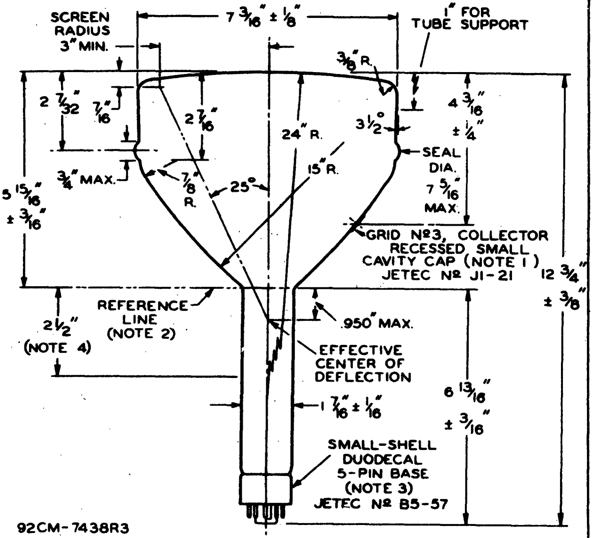
** For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward faceplate and center line of air gap 2-3/4" from Reference Line (see Outline Drawing) and ultor current of 200 microamperes.

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

RCA

7MP7
OSCILLOGRAPH TUBE



92CM-7438R3

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND BULB TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. BULB TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE REFERENCE-LINE GAUGE (JETEC No.112) 1.500 + .003"- .000" I. D. AND 2" LONG WILL REST ON BULB CONE.

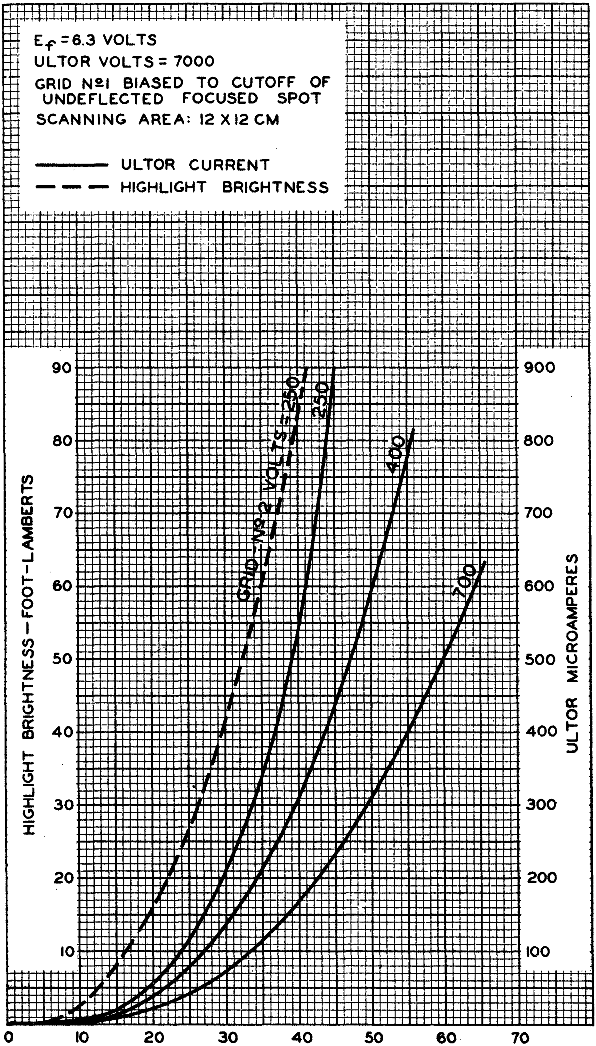
NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED: IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF 1-7/8".

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

RCA

7MP7

AVERAGE GRID-DRIVE CHARACTERISTICS



7NP4

PROJECTION KINESCOPE

20' x 15' PICTURES

FORCED-AIR COOLED — ALUMINIZED SCREEN

ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

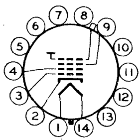
For use in theater-television equipment

DATA

General:

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

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



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

← Indicates a change.

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

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 (Ec_4g_1) between 70000# and 80000 volts and grid-No.2-to-grid-No.1 voltage (Ec_2g_1) between 400 and 850 volts

Grid-No.3-to-Grid-No.1 Voltage for focus	20% to 22.6% of Ec_4g_1	volts
Grid-No.2-to-Grid-No.1 Voltage for visual extinction of focused raster when circuit design utilizes fixed cathode-to-grid-No.1 voltage (Ekg_1)	3.2 to 4.8 times Ekg_1	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level) to White-Level Value	Same value as fixed cathode-to-grid-No.1 voltage except video drive is a negative voltage.	

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

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7NP4
PROJECTION KINESCOPE

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

Examples of Use of Design Ranges:

For ultor-to-grid-No. 1 voltage of	*75000*	*volts*
Grid-No.3-to-Grid-No.1 Voltage for focus.	15000 to 17000	volts
Grid-No.2-to-Grid-No.1 Voltage for visual extinction of focused raster when circuit design utilizes fixed cathode-to-grid-No.1 voltage (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.

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

7NP4

PROJECTION KINESCOPE

Equipment Design Ranges:

With any ultor voltage (Ec_4k) between 70000# and 80000 volts and grid-No.2 voltage (Ec_2k) between 400 and 600 volts

Grid-No.3 Voltage for focus.	20% to 22.6% of Ec_4k	volts
Grid-No.2 Voltage for visual extinction of focused raster when circuit design utilizes fixed grid-No.1 voltage (Ec_1k). . .	2.58 to 3.87 times Ec_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	µa
Grid-No.2 Current.	−15 to +15	µa

Examples of Use of Design Ranges:

For ultor voltage of	*75000*	*volts*
Grid-No.3 Voltage for focus. . .	15000 to 17000	volts
Grid-No.2 Voltage for visual extinction of focused raster when circuit design utilizes fixed grid-No.1 voltage (Ec_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.

PROJECTION KINESCOPE

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

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

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

An *air-cooling system* is required to cool the face of the 7NP4. The system consists of a blower, such as Pilot No.50747 or No.50748*, and an air duct, having an outlet diameter of about 2 inches, directed perpendicularly onto the face of the tube. An air flow of 40 cubic feet per minute at the tube face is required to provide adequate cooling. In a typical system with air filter, the total system static pressure is approximately 0.25 inch of water. The cooling air must not contain water, dust, or other foreign matter. The air-cooling system should be electrically interconnected with the ultor power supply to prevent operation of the tube without cooling.

Cooling of the tube by a tangential flow of air across its face is not recommended because the temperature gradient produced across the face may result in immediate or delayed cracking of the face.

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

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

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

7NP4

PROJECTION KINESCOPE

PRECAUTION

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

OPERATING HINTS

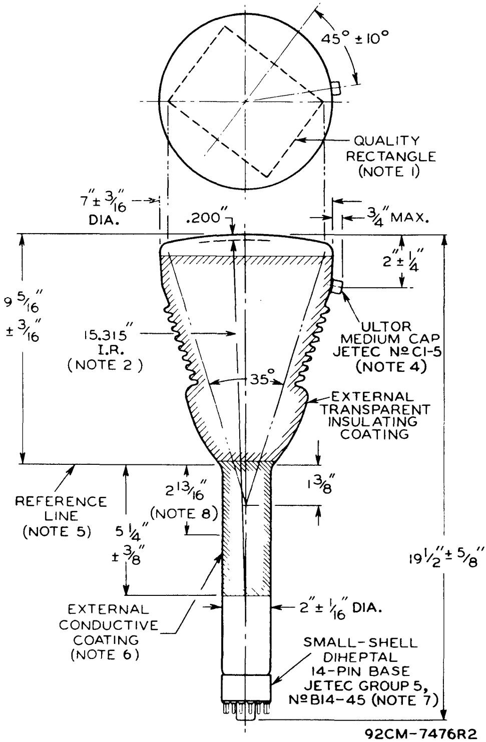
1. Never apply power input to the screen suddenly because immediate or delayed cracking of the face may result. Always increase or decrease the ultor current gradually.
2. Never exceed the maximum average ultor-current rating of 2 milliamperes.
3. Never overscan the screen because the beam will strike the neck and liberate occluded gas which may cause internal arcing.
4. Never fail to operate this tube in its equipment at intervals of about 2 months to keep the tube in condition.

→ Indicates a change.

RCA

7NP4

PROJECTION KINESCOPE



92CM-7476R2

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

PROJECTION KINESCOPE

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

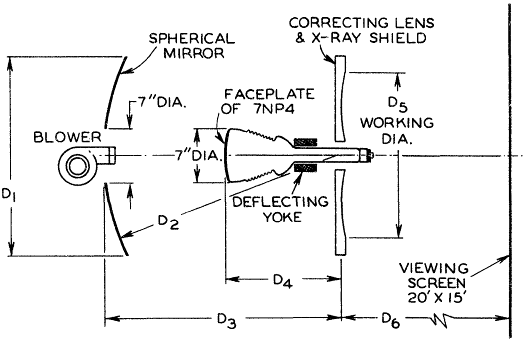
NOTE 5: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 2.100" ± 0.001" I.D. AND 3" LONG WILL REST ON BULB CONE.

NOTE 6: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 7: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. SOCKET CONTACTS FOR PINS 5, 6, 7, 8, 10, 11, 12, AND 13 SHOULD BE REMOVED IN ORDER TO PROVIDE MAXIMUM INSULATION FOR PIN 9.

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

TYPICAL REFLECTIVE OPTICAL SYSTEM



92CS-9763

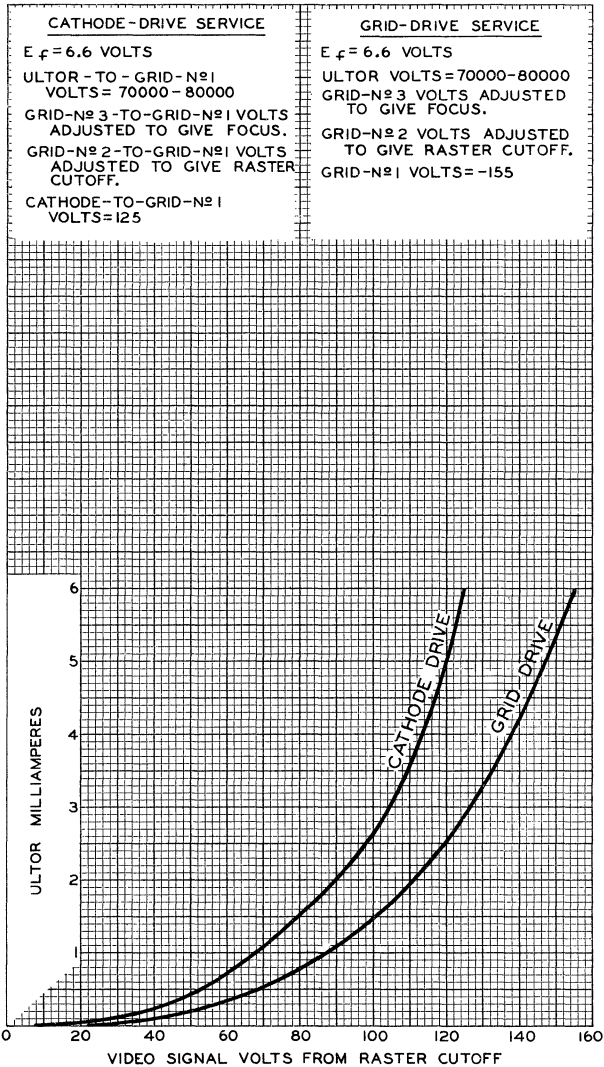
DIMENSIONS (APPROX.)

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

7NP4

7NP4

AVERAGE DRIVE CHARACTERISTICS



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" x 3¾"

GRID-DRIVE SERVICE

E_f = 6.6 VOLTS

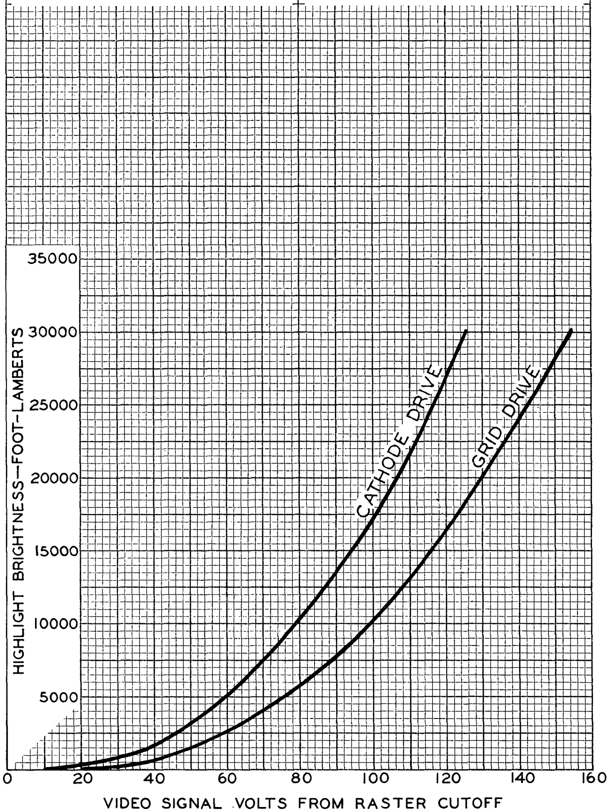
ULTOR VOLTS = 75000

GRID-№3 VOLTS ADJUSTED TO GIVE FOCUS.

GRID-№2 VOLTS ADJUSTED TO GIVE RASTER CUTOFF.

GRID-№1 VOLTS = −155

RASTER SIZE = 5" x 3¾"



ELECTRON TUBE DIVISION

92CM-7515R1

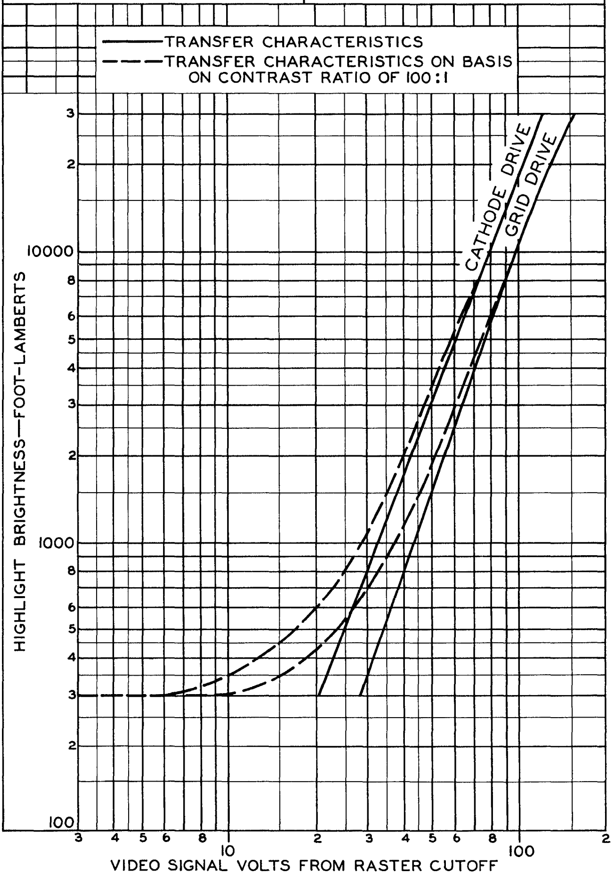
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

7NP4

AVERAGE DRIVE CHARACTERISTICS

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



ELECTRON TUBE DIVISION

92CM-7519R2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7TP4
MONITOR KINESCOPE

METAL-BACKED SCREEN

ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

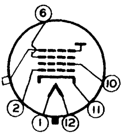
DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to All Other Electrodes	6	μμf
Cathode to All Other Electrodes	5	μμf
Faceplate		Clear Glass
Phosphor, Metal-Backed°		P4—Sulfide Type
Fluorescence and Phosphorescence		White
Persistence of Phosphorescence		Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angle (Approx.)		50°
Overall Length		13-1/8" ± 3/8"
Greatest Diameter of Bulb		7-3/16" ± 1/8"
Minumum Useful Screen Diameter		6"
Picture Size (Within minimum-useful-screen area)		5-3/8" x 4"
Cap		Recessed Small Cavity (JETEC No. J1-21)
Base		Small-Shell Duodecal 6-Pin (JETEC No. B6-63)

BOTTOM VIEW

Pin 1 – Heater
Pin 2 – Grid No.1
Pin 6 – Grid No.3
Pin 10 – Grid No.2
Pin 11 – Cathode



Pin 12 – Heater
Cap – Grid No.4, Collector (Ultor)

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

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

° For curves, see front of this Section.

• In the 7TP4, grid No.4 which has the ultor function, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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 μamp. . .	11.6% to 15.8% of E_u	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot.	11% to 25.7% of E_{c2}	volts
Grid-No.3 Current**.	See Curves	
Grid-No.2 Current.	-15 to +15	μamp
Field Strength of Adjustable Centering Magnet.	0 to 8	gausses

Examples of Use of Design Ranges:

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

Maximum Circuit Values:

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

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

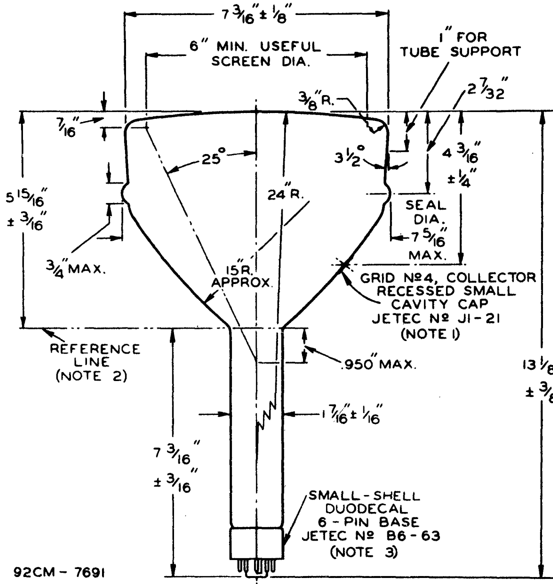
**Grid-No.3 Current increases as the ultor voltage is decreased.

FEB. 1, 1952 TENTATIVE DATA

RCA

7TP4

MONITOR KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND BULB TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS OF ± 10°. BULB TERMINAL IS ON SAME SIDE AS PIN No.6.

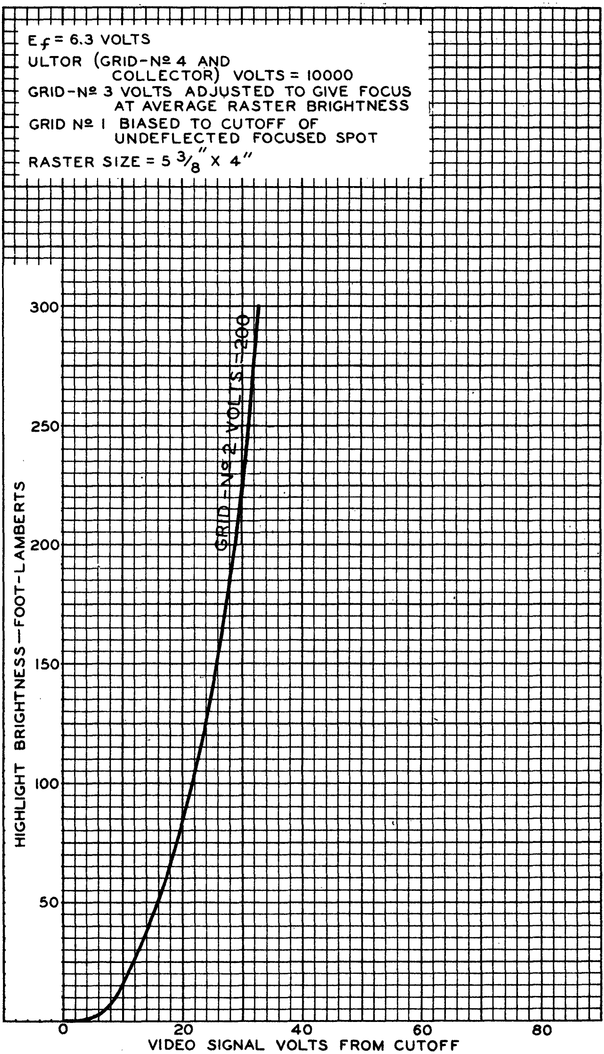
NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE REFERENCE-LINE GAUGE (JETEC No.112) 1.500" + 0.003" - 0.000" I.D. AND 2" LONG WILL REST ON BULB CONE.

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

RCA

7TP4

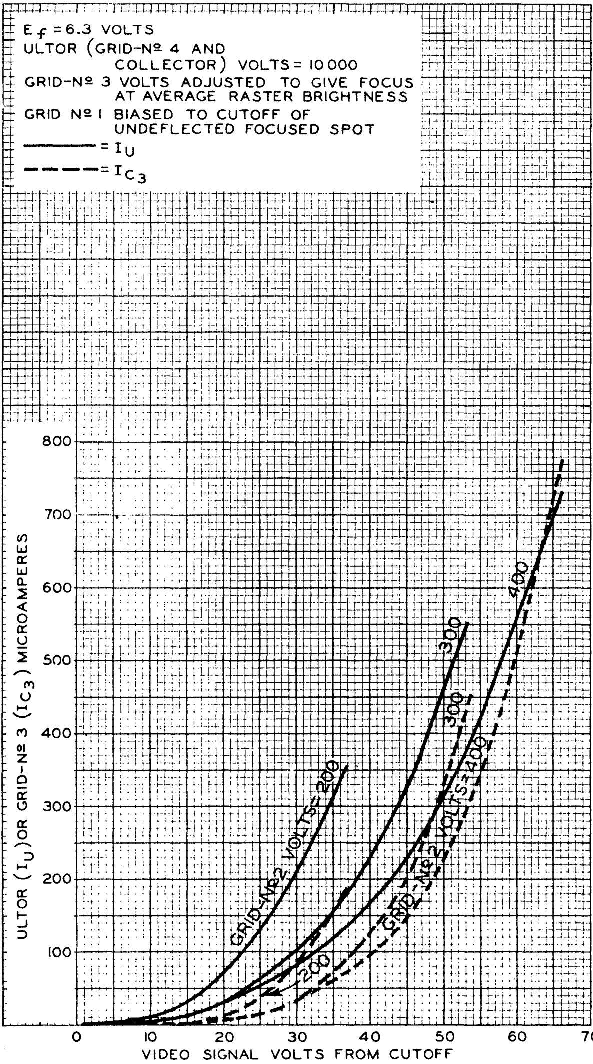
AVERAGE GRID-DRIVE CHARACTERISTICS



7TP4

7TP4

AVERAGE GRID-DRIVE CHARACTERISTICS



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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

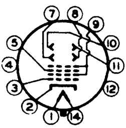
Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes	6	μμf
DJ_1 to DJ_2	3	μμf
DJ_3 to DJ_4	2	μμf
DJ_1 to All Other Electrodes	9	μμf
DJ_2 to All Other Electrodes	9	μμf
DJ_3 to All Other Electrodes	7	μμf
DJ_4 to All Other Electrodes	7	μμf

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

BOTTOM VIEW

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



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

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

With DJ_1 positive with respect to DJ_2, the spot is deflected toward pin 5. With DJ_3 positive with respect to DJ_4, the spot is deflected toward pin 2.

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

●: See next page.

7VP1

7VP1

OSCILLOGRAPH TUBE

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

ULTOR● VOLTAGE	4000 max.	volts
GRID-No.3 VOLTAGE	2000 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	200 max.	volts
Positive bias value*	0 max.	volts
Positive peak value	2 max.	volts
PEAK VOLTAGE BETWEEN ULTOR AND ANY DEFLECTING ELECTRODE	750 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

Equipment Design Ranges:

For any ultor voltage (E_u) between 1000# and 4000 volts

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

Examples of Use of Design Ranges:

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

Maximum Circuit Values:

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

● In the 7VP1, grid No.4 which has the ultor function, grid No.2, and collector are connected together within the tube and are conveniently referred to collectively as "ultor." The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

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

#,##,°: See next page.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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7VPI

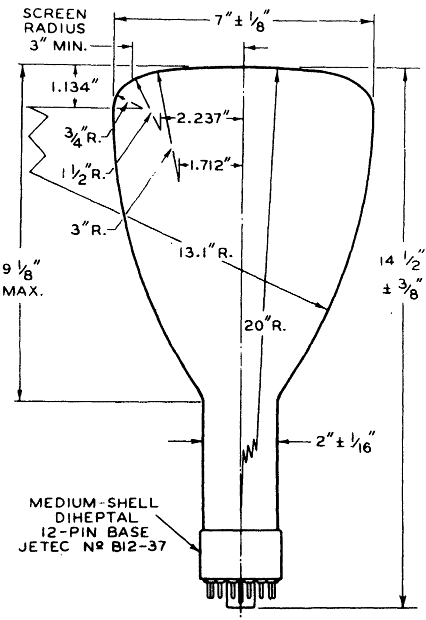
OSCILLOGRAPH TUBE

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.



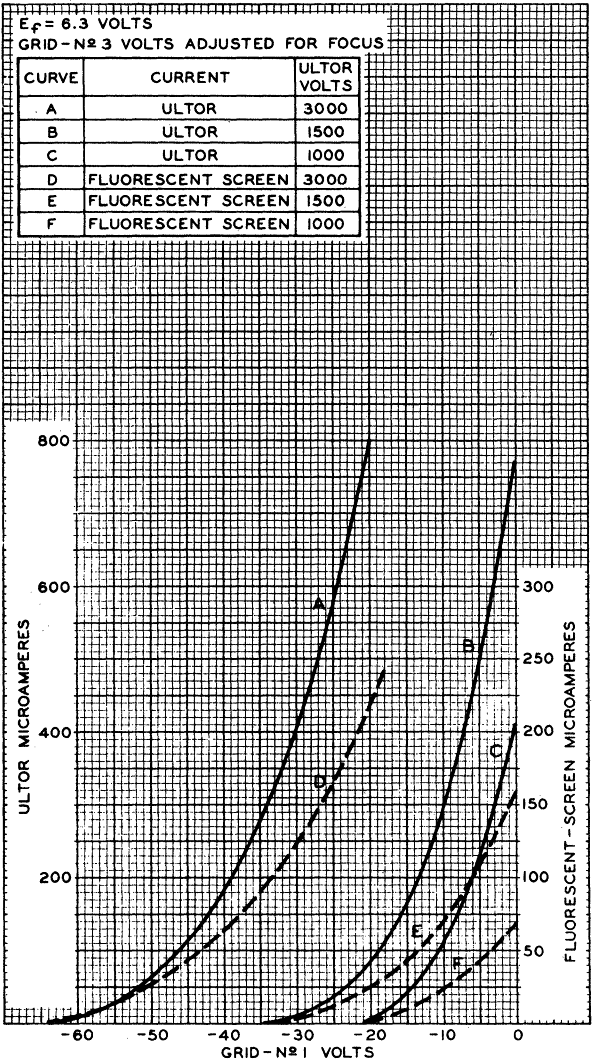
92CM-6667R1

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

RCA

7VP1

AVERAGE CHARACTERISTICS



DEC. 17, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7721

7WP4

7WP4

PROJECTION KINESCOPE

20' x 15' PICTURES

FORCED-AIR COOLED — ALUMINIZED SCREEN

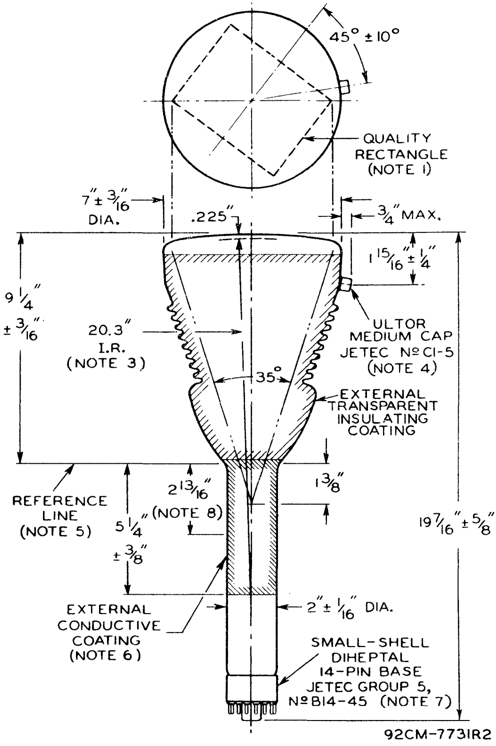
ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

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"



RCA

7WP4

PROJECTION KINESCOPE

NOTE 1: WHEN VIEWED FROM THE FACE OF THE TUBE, THE MINOR AXIS OF THE 5" x 3-3/4" QUALITY RECTANGLE IS LOCATED 45° ± 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.

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

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

NOTE 6: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 7: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. SOCKET CONTACTS FOR PINS 5, 6, 7, 8, 10, 11, 12, AND 13 SHOULD BE REMOVED IN ORDER TO PROVIDE MAXIMUM INSULATION FOR PIN 9.

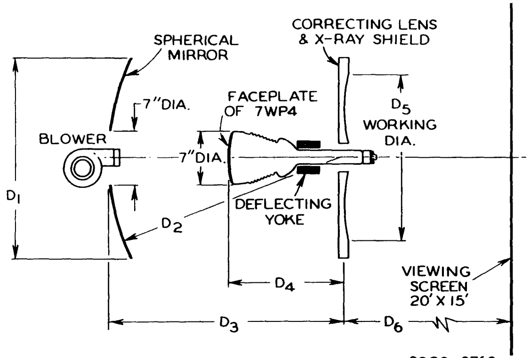
NOTE 8: EFFECTIVE DEFLECTING FIELD MUST BE WITHIN THIS SPACE.

RCA

7WP4

PROJECTION KINESCOPE

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'

8DP4

PICTURE TUBE

SMALL, COMPACT, RECTANGULAR GLASS TYPE

LOW-VOLTAGE ELECTROSTATIC FOCUS   MAGNETIC DEFLECTION

DATA

General:

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

Capacitance between External Conductive Coating and Ultor . . . . {350 max. μμf; 250 min. μμf}

Faceplate, Spherical . . . . Filterglass

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

Deflection Angles (Approx.):
- Diagonal . . . . 90°
- Horizontal . . . . 85°
- Vertical . . . . 68°

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

Tube Dimensions:
- Overall length . . . . 10-7/16" ± 5/16"
- Greatest width . . . . 7-7/8" + 1/16" − 1/32"
- Greatest height . . . . 6-1/16" + 1/16" − 1/32"
- Diagonal . . . . 8-7/16" + 1/16" − 1/32"
- Neck length . . . . 6-1/2" ± 3/16"
- Radius of curvature of faceplate (External surface) . . . . 27"

Screen Dimensions (Minimum):
- Greatest width . . . . 7-3/16"
- Greatest height . . . . 5-3/8"
- Diagonal . . . . 7-13/16"
- Projected area . . . . 35.5 sq. in.

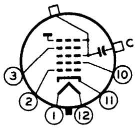
Operating Position . . . . Any

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

Base . .Dwarf-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-158) ←

Basing Designation for BOTTOM VIEW 12AB

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.4
Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater



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

Maximum Ratings, *Design-Center Values:*

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

← Indicates a change.

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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

RCA

8HP4
MONITOR KINESCOPE

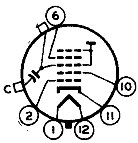
SMALL, COMPACT, RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	9	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	350 max.	μμf
	250 min.	μμf
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

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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 ($E_{c_5 k}$) between 8000# and 14000 volts and grid-No.2 voltage ($E_{c_2 k}$) 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-μa change in ultor current. For typical values, see *Examples of Use of Design Ranges.*

Grid-No.1 Voltage ($E_{c_1 k}$) 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 $E_{c_1 k}$ except video drive is positive voltage.

Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa

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 μa●	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

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.

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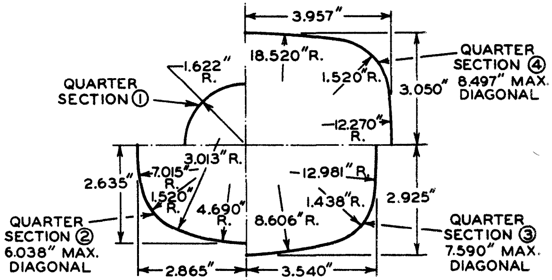
RCA

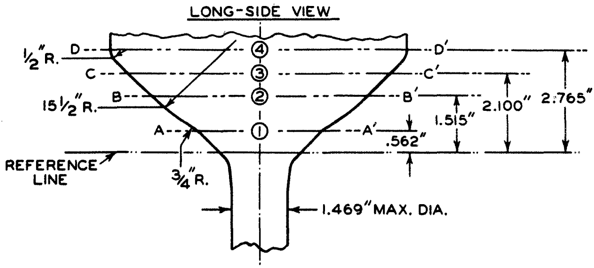
8HP4

MONITOR KINESCOPE

BULB-CONTOUR DIMENSIONS



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



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 ± 0.125".

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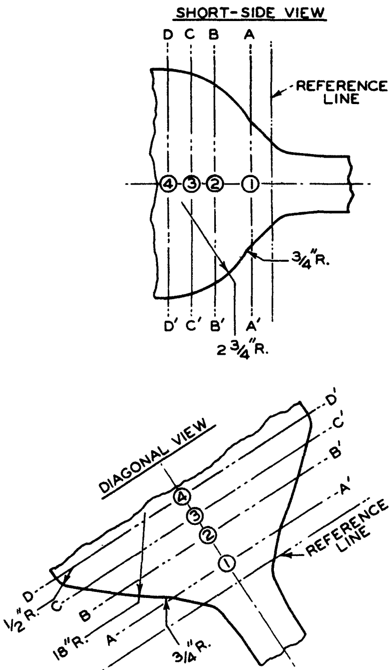
8HP4

MONITOR KINESCOPE

FOR MAXIMUM SPACE REQUIREMENTS



92CM-8896

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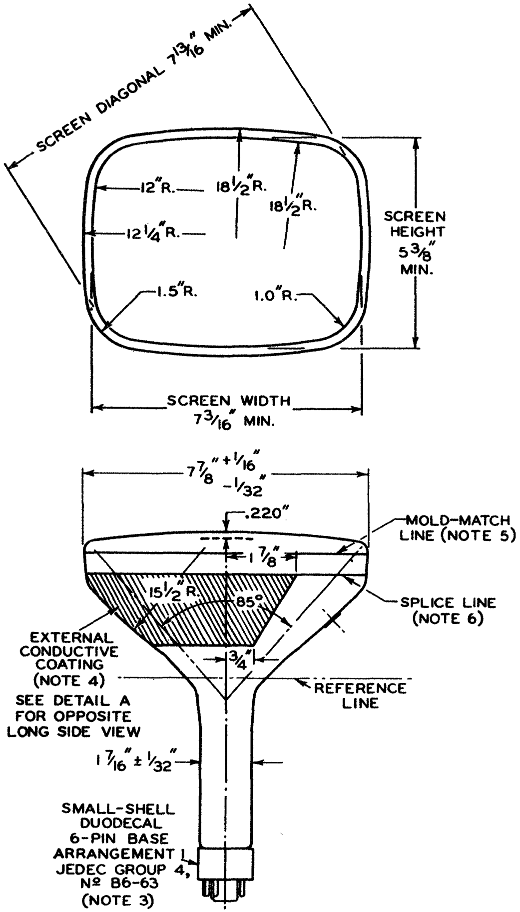
RCA

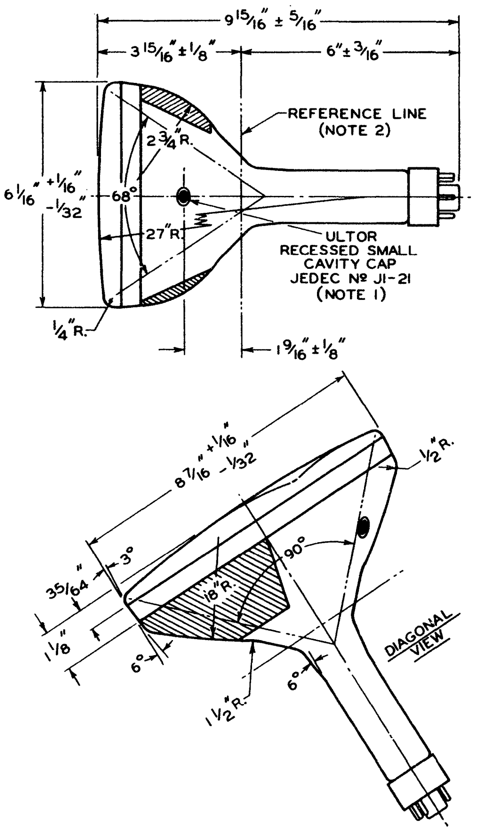
8HP4

MONITOR KINESCOPE



8HP4

MONITOR KINESCOPE



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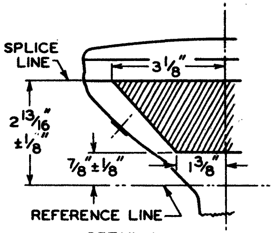
8HP4
MONITOR KINESCOPE



DETAIL A

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

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AT THE REFERENCE LINE AND HAVING A DIAMETER OF 1-5/8 INCHES.

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

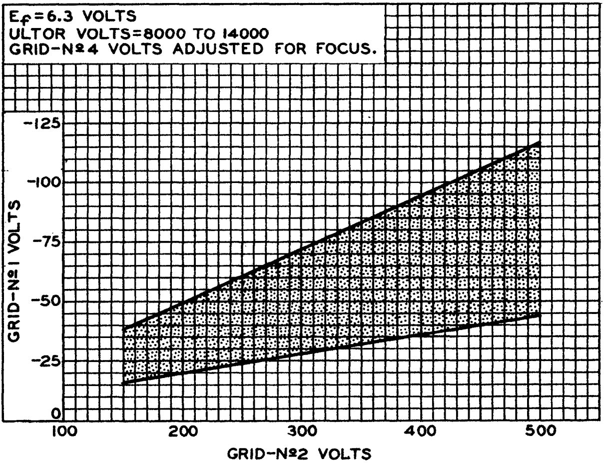
NOTE 5: THE MAXIMUM RADIAL DISPLACEMENT OF THE PERIPHERY OF THE FACE PANEL (JUST ABOVE THE MOLD-MATCH LINE) FROM ITS EXACT CENTERED POSITION ON THE NECK AXIS IS 0.040".

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

8HP4

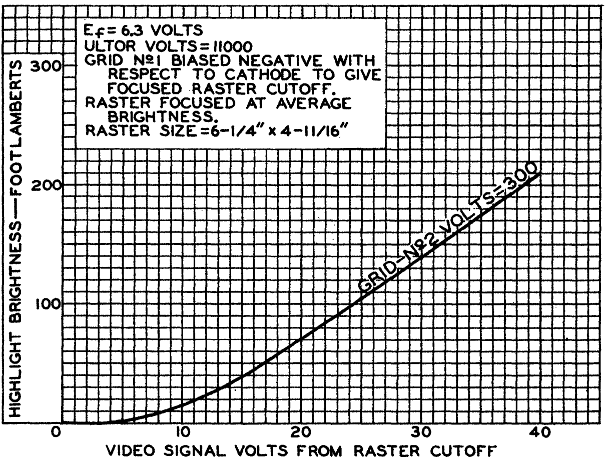
8HP4

RASTER-CUTOFF-RANGE CHART



92CS-9628

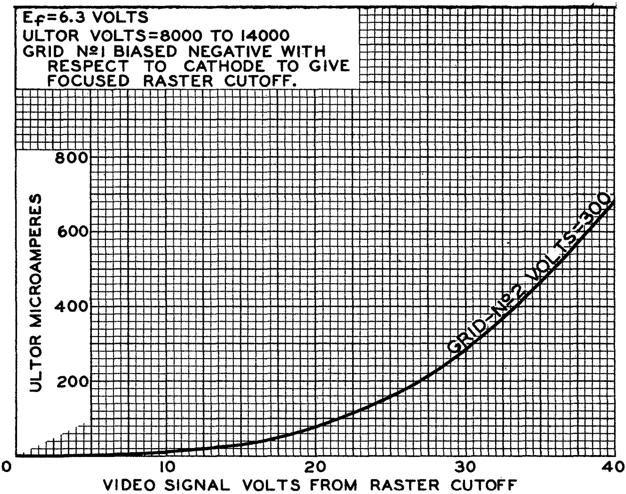
TYPICAL GRID-DRIVE CHARACTERISTIC



RCA

8HP4

TYPICAL GRID-DRIVE CHARACTERISTIC



92CS-9630

RCA

10BP4-A

PICTURE TUBE

ROUND GLASS TYPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

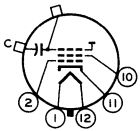
General:

Heater, for Unipotential Cathode:

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

Capacitance between External Conductive Coating and Ultor	2500 max. μμf 500 min. μμf
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" ± 3/8"
Greatest Diameter of Bulb	10-1/2" ± 1/8"
Minimum Useful Screen Diameter	9-1/8"
Operating Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Base	Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57)
Basing Designation for BOTTOM VIEW	12N

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



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

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

ULTOR VOLTAGE	12000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Maximum Circuit Values:

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

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

← Indicates a change.

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

10FP4-A

10FP4-A
PICTURE TUBE

ROUND GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

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

Capacitance between External Conductive Coating and Ultor: 2500 max. μμf; 500 min. μμf

Faceplate, Spherical . . . Filterglass

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

Deflection Angle (Approx.) . . . 50°

Electron Gun . . . Type Requiring No Ion-Trap Magnet

Overall Length . . . 17-5/8" ± 3/8"

Greatest Diameter of Bulb . . . 10-1/2" ± 1/16" ←

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

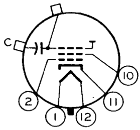
Operating Position . . . Any

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

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

Basing Designation for BOTTOM VIEW . . . 12N ←

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



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

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

ULTOR VOLTAGE	12000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	140 max.	volts
Heater positive with respect to cathode	140 max.	volts

Maximum Circuit Values:

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

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

← Indicates a change.

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 $\mu\mu$f
- Cathode to all other electrodes . . . . 5 $\mu\mu$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^{o}

Overall Length . . . . 16-5/8" ± 3/8"

Greatest Diameter of Bulb . . . . 10-1/2" ± 1/16"

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

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

Weight (Approx.) . . . . 10 lbs

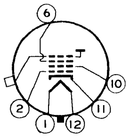
Operating Position . . . . Any

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 - Ultor (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.

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

10SP4

MONITOR KINESCOPE

Equipment Design Ranges:

For any ultor voltage (Ec_4) between 10000 and 20000 volts and grid-No.2 voltage (Ec_2) between 150 and 410 volts*

Grid-No.3 Voltage for focus with ultor current of 100 μa.	11.7% to 15.9% of Ec_4	volts
Grid-No.1 Voltage for visual extinction of 8" x 6" raster	9% to 24% of Ec_2	volts
Maximum Grid-No.3 Current**.	*See Curves*	
Grid-No.2 Current.	-15 to +15	μa
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 μa.	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.

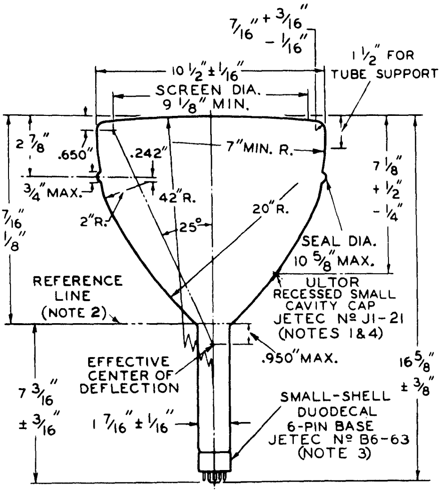
** Grid-No.3 current increases as the ultor voltage is decreased.

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

→ Indicates a change.

10SP4

MONITOR KINESCOPE



92CM-7729R1

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 ± 10°. 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.

ELECTRON TUBE DIVISION
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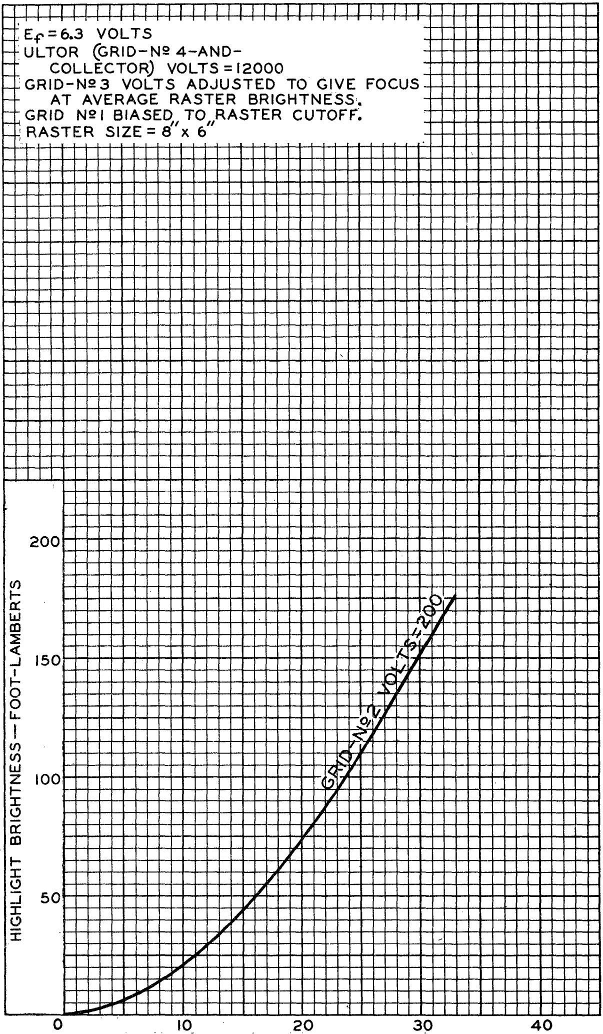
RCA

10SP4

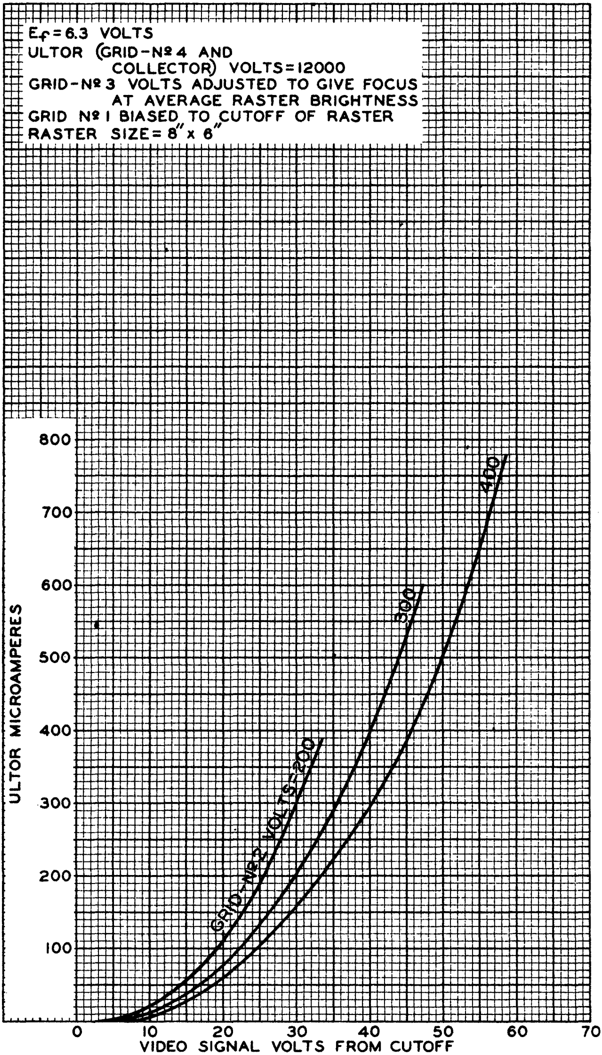
AVERAGE GRID-DRIVE CHARACTERISTIC



RCA

10SP4

AVERAGE GRID-DRIVE CHARACTERISTICS



MAR. 21, 1952

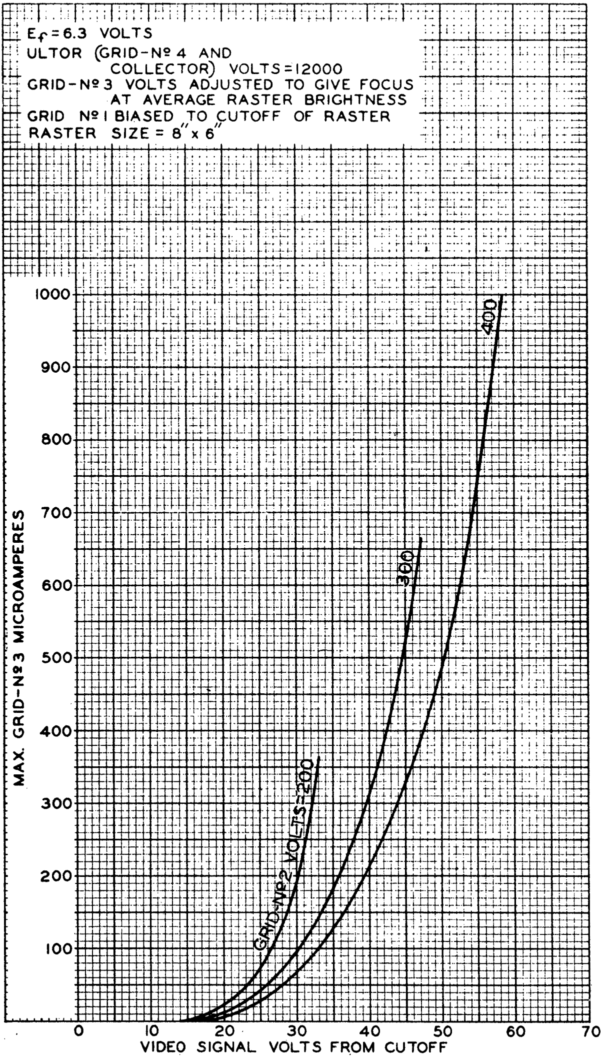
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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

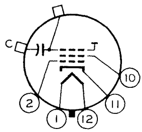
ROUND GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

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

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



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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	12000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	140 max.	volts
Heater positive with respect to cathode	140 max.	volts

Maximum Circuit Values:

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

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

← Indicates a change.

14ATP4
PICTURE TUBE

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

Intended for use in equipment having series heater-string arrangement

DATA

General:

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

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

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . 6 μμf
- Cathode to all other electrodes . . . 5 μμf
- External conductive coating to ultor . . 1000 max. μμf; 500 min. μμf

Faceplate, Spherical . . . Filterglass
- Light transmission (Approx.) . . . 78%

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

Focusing Method . . . Electrostatic
Deflection Method . . . Magnetic
Deflection Angles (Approx.):
- Diagonal . . . 90°
- Horizontal . . . 85°
- Vertical . . . 68°

Electron Gun . . . Type Requiring No Ion-Trap Magnet
Tube Dimensions:
- Overall length . . . 13-3/16" ± 5/16"
- Greatest width . . . 13-1/16" ± 1/8"
- Greatest height . . . 10-9/16" ± 1/8"
- Diagonal . . . 14" ± 1/8"
- Neck length . . . 5-1/2" ± 3/16"

Screen Dimensions (Minimum):
- Greatest width . . . 12-1/16"
- Greatest height . . . 9-1/2"
- Diagonal . . . 13"
- Projected area . . . 104 sq. in.

Weight (Approx.) . . . 8.5 lbs
Mounting Position . . . Any
Cap . . . Recessed Small Cavity (JETEC No.J1-21)
Bulb . . . J112 (90°)
Base . . . Small-Shell Duodecal 6-Pin (JETEC No.B6-63)

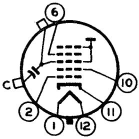
RCA

14ATP4

PICTURE TUBE

Basing Designation for BOTTOM VIEW 12L

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



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

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	{14000 max. / 8000 min.	volts / volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	200 max.	volts
Negative bias value	140 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor voltage ($E_{c_5}k$) between 8000 and 14000 volts and grid-No.2 voltage ($E_{c_2}k$) between 200 and 500 volts

Grid-No.4 Voltage for Focus§	0 to 400	volts
Grid-No.1 Voltage ($E_{c_1}k$) for Visual Extinction of Focused Raster.	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive).	Same value as determined for $E_{c_1}k$ except video drive is a positive voltage	
Grid-No.4 Current.	-25 to +25	μa
Grid-No.2 Current.	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*.	0 to 8	gausses

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

§,*: See next page.

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14ATP4

PICTURE TUBE

Examples of Use of Design Ranges:

With ultor voltage of	*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 (Ec_5g_1) between 8000 and 14000 volts

and grid-No.2-to-grid-No.1 voltage (Ec_2g_1) between 225 and 640 volts

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

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

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

*: See next page.

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14ATP4

PICTURE TUBE

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

Examples of Use of Design Ranges:

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

Maximum Circuit Values:

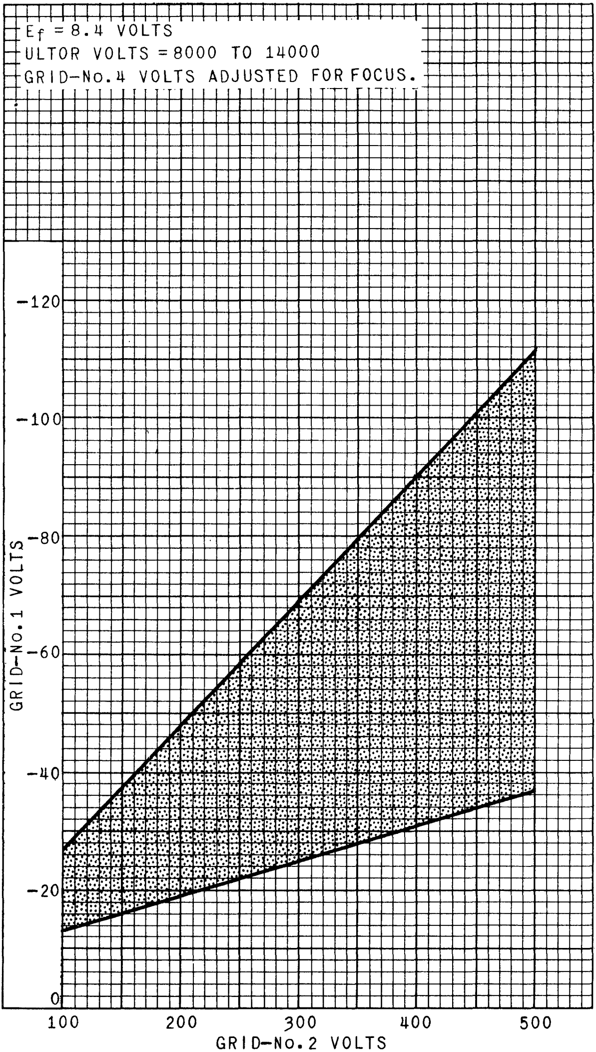
Grid-No.1-Circuit Resistance	1.5 max.	megohms

* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having 1/4-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 7/16-inch deflection of the spot from the center of the tube face.

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

14ATP4

RASTER-CUTOFF-RANGE CHART
For Grid-Drive Service



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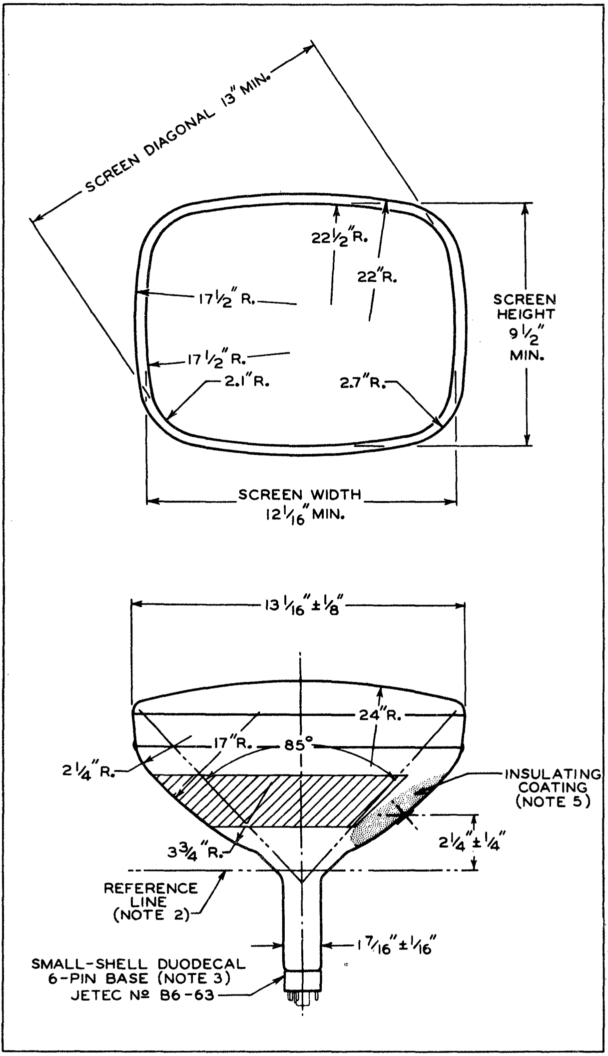
14ATP4
PICTURE TUBE



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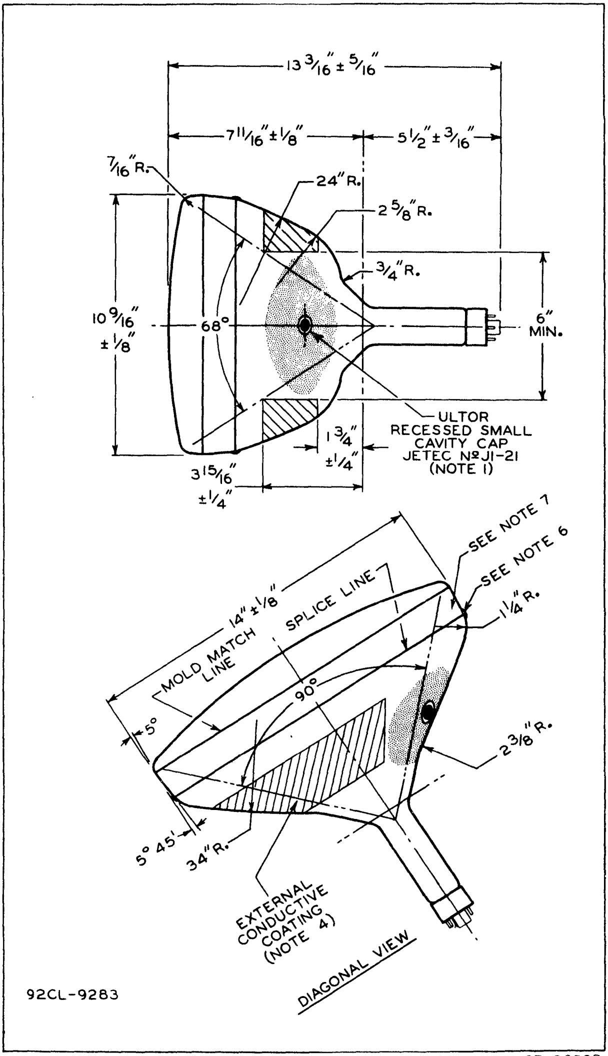
14ATP4
PICTURE TUBE



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14ATP4

PICTURE TUBE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND BULB TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^{\circ}$. 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.

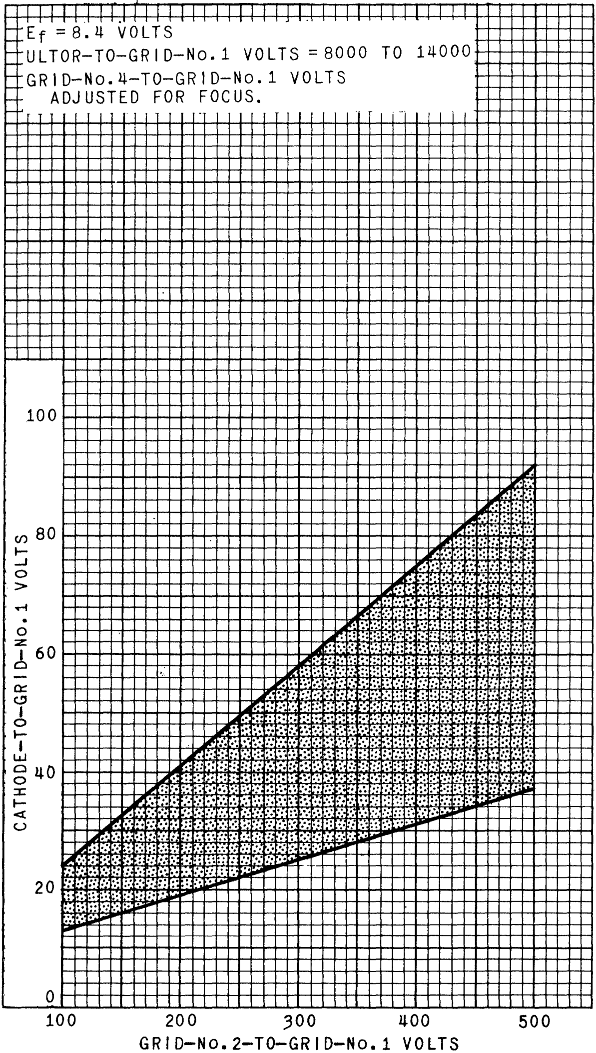
NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

14ATP4

14ATP4

RASTER-CUTOFF-RANGE CHART

For Cathode-Drive Service



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

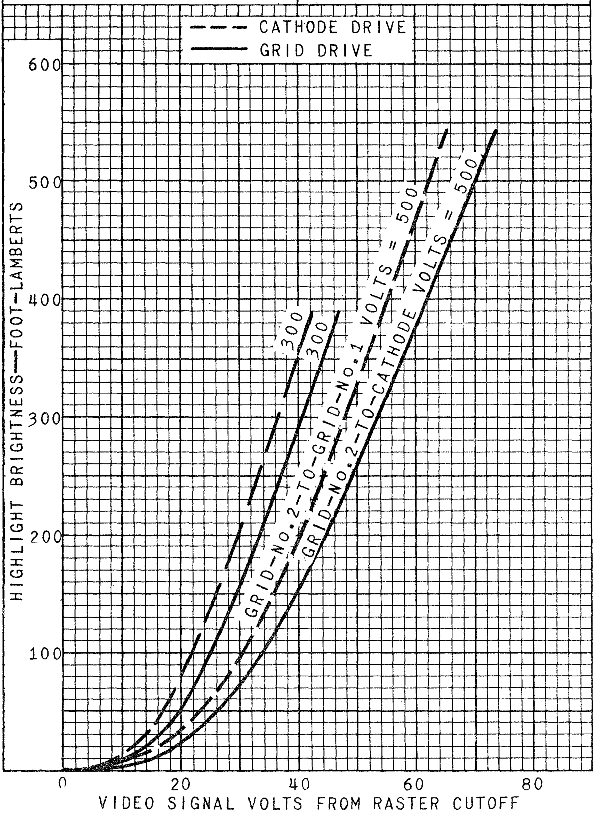
92CS-9276

RCA

14ATP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-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"	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"



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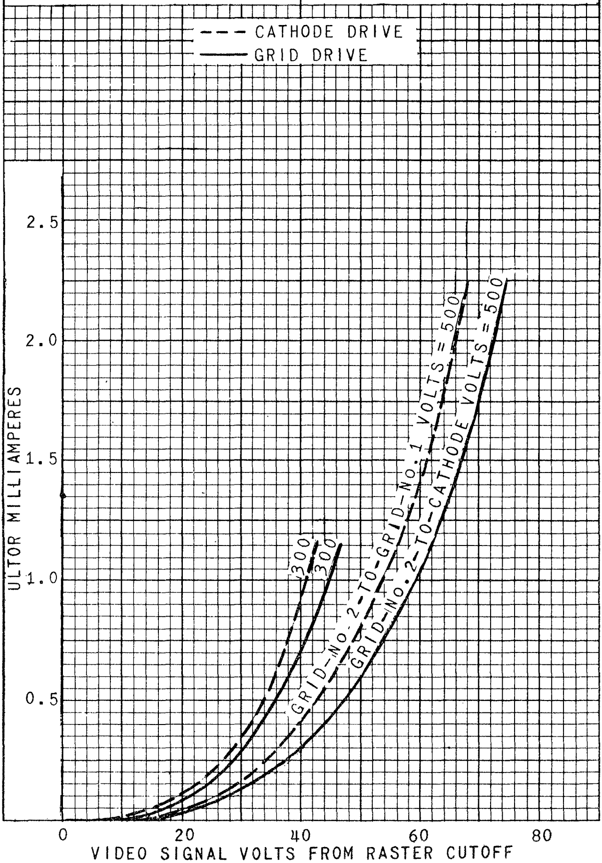
14ATP4

AVERAGE DRIVE CHARACTERISTICS

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



14BAP4

Picture Tube

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

GENERAL DATA

Electrical:

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

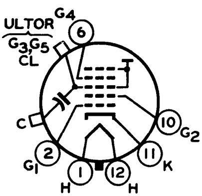
Optical:

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

Mechanical:

Operating Position . . . . .Any
Weight (Approx.) . . . . 10 lbs
Overall Length . . . . 16-25/32" ± 3/8"
Neck Length. . . . . 7-1/2" ± 3/16"
Projected Area of Screen . . . . 96 sq. in.
External Conductive Coating:
  Type . . . . Regular Band
  Contact area for grounding . . . . .Near Reference Line
For Additional Information on Coatings and Dimensions:
  See *Picture-Tube Dimensional-Outlines* and *Bulb J109-1/2 A/C* sheets at the front of this section
Cap. . . . . Recessed Small Cavity (JEDEC No.J1-21)
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. . . . . 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

14EP4

Picture Tube

RECTANGULAR GLASS TYPE

MAGNETIC 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. .	2000 max.	pf
	750 min.	pf
Heater Current at 6.3 volts	600 ± 30	ma

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

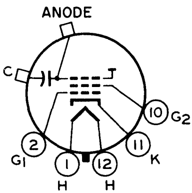
Optical:

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

Mechanical:

Weight (Approx.). 10 lbs
Overall Length. . . . . 16-15/32" ± 3/8"
Neck Length . . . . 7-3/16" ± 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

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

RCA

14QP4-A
PICTURE TUBE

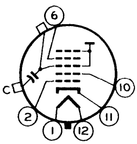
SHORT RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
Voltage . . . . 6.3 . . . . ac or dc volts
Current . . . . 0.6 ± 10% . . . . amp
Capacitance between External Conductive Coating and Ultor . . . . 1000 max. μμf; 600 min. μμf
Faceplate, Spherical . . . . Filterglass
Phosphor (For Curves, see front of this Section) . . P4—Sulfide Type Aluminized
Deflection Angles (Approx.):
Diagonal . . . . 70°
Horizontal . . . . 65°
Vertical . . . . 50°
Electron Gun . . . . Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:
Overall length . . . . 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
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 . . . . 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.

14QP4-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. .	1200 max.	pf
	800 min.	pf
Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

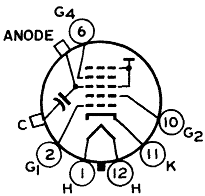
Optical:

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

Mechanical:

Weight (Approx.). . . . . 8.5 lbs
Overall Length. . . . . 13-3/16" ± 5/16"
Neck Length . . . . 5-1/2" ± 3/16"
Projected Area of Screen. . . . . 104 sq. in.
External Conductive Coating:
  Type. . . . . .Regular-Band
  Contact area for grounding. . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
  See *Picture-Tube Dimensional-Outlines and Bulb 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

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

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

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

ANODE VOLTAGE	15500 max.	volts
	9000 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	200 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode:		
Combined AC and DC voltage	200 max.	volts
DC component	100 max.	volts

Typical Operating Conditions for Grid-Drive Service:

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

Anode Voltage	12000	volts
Grid-No.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

RCA

15GP22
TRICOLOR KINESCOPE

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

DATA

General:

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

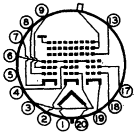
15GP22

TRICOLOR KINESCOPE

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

BOTTOM VIEW

Pin 1: Heater
Pin 2: Cathode of Red Gun
Pin 3: Grid No.1 of Red Gun
Pin 4: Grid No.2 of Red Gun
Pin 5: No Connection
Pin 6: Grids No.3
Pin 7: Cathode of Green Gun
Pin 8: Grid No.1 of Green Gun



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

Maximum Ratings, *Design-Center Values:*

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

Equipment Design Ranges:

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

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

● The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 15GP22, the ultor function is performed by grid No.5. Since grid No.5, grid No.6, and collector are connected together within the tube, they are collectively referred to simply as "ultor", for convenience in presenting data and curves.

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

† See next page.

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TRICOLOR KINESCOPE

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

Examples of Use of Design Ranges:

For ultor voltage of 20000 volts

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

Circuit Values:

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

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

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

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

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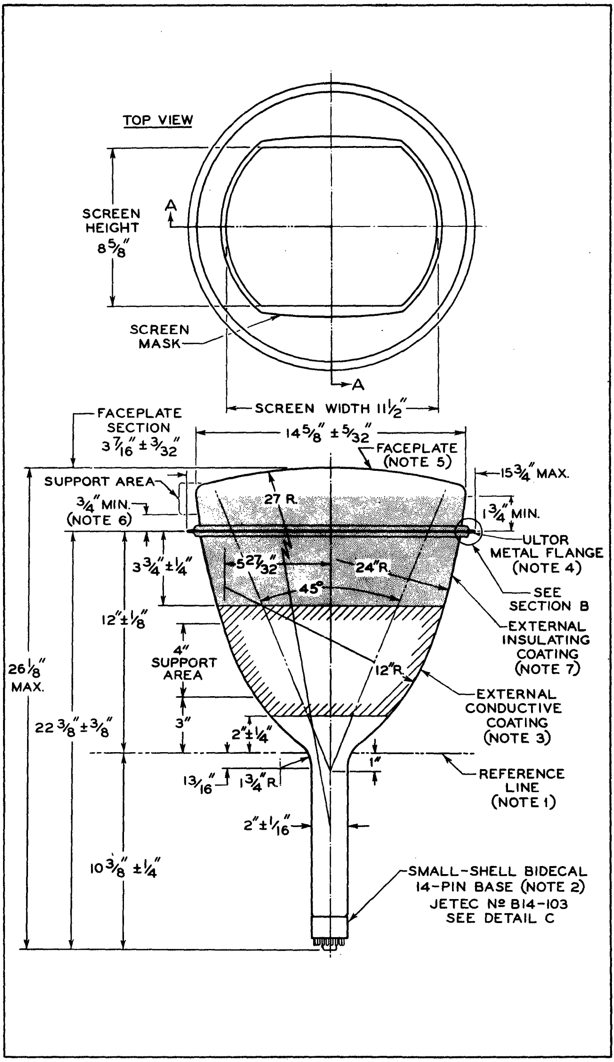
15GP22

TRICOLOR KINESCOPE



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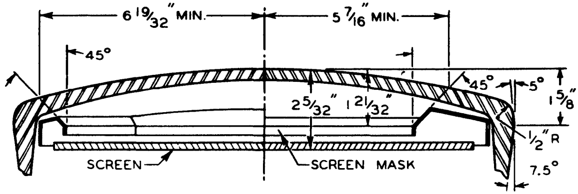
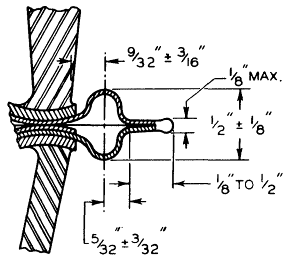
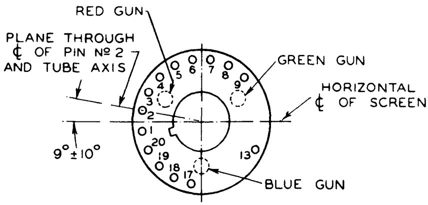
TRICOLOR KINESCOPE



ENLARGED SECTION A-A



ENLARGED SECTION B



BASE DETAIL C
BOTTOM VIEW

92CL-8072R1

15GP22

15GP22

TRICOLOR KINESCOPE

NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE A CYLINDRICAL GAUGE 2.400" ± 0.001" I.D. WHICH IS HELD CONCENTRIC WITH TUBE NECK AXIS WILL REST ON FUNNEL.

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

NOTE 3: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

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

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

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

RCA

16ADP7

16ADP7

OSCILLOGRAPH TUBE

METAL-SHELL ENVELOPE

MAGNETIC FOCUS MAGNETIC DEFLECTION

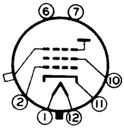
DATA

General:

Heater, for Unipotential Cathode:
Voltage . . . . 6.3 . . . . ac or dc volts
Current . . . . 0.6 . . . . amp
Direct Interelectrode Capacitances (Approx.):
Grid No.1 to All Other Electrodes . . . . . . 6 μμf
Cathode to All Other Electrodes . . . . . . 5 μμf
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.

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16ADP7
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 Undeflected Focused Spot	-27 to -63	volts
Grid-No.2 Current	-15 to +15	μamp
Focusing-Coil Current (DC)°°.	95 ± 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.

°° 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.

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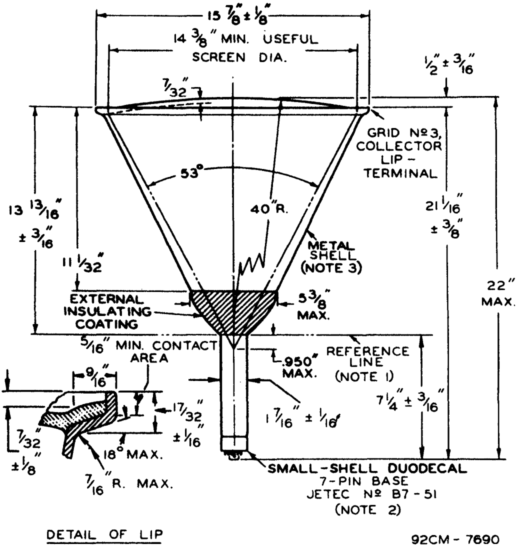
16ADP7

OSCILLOGRAPH TUBE



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.

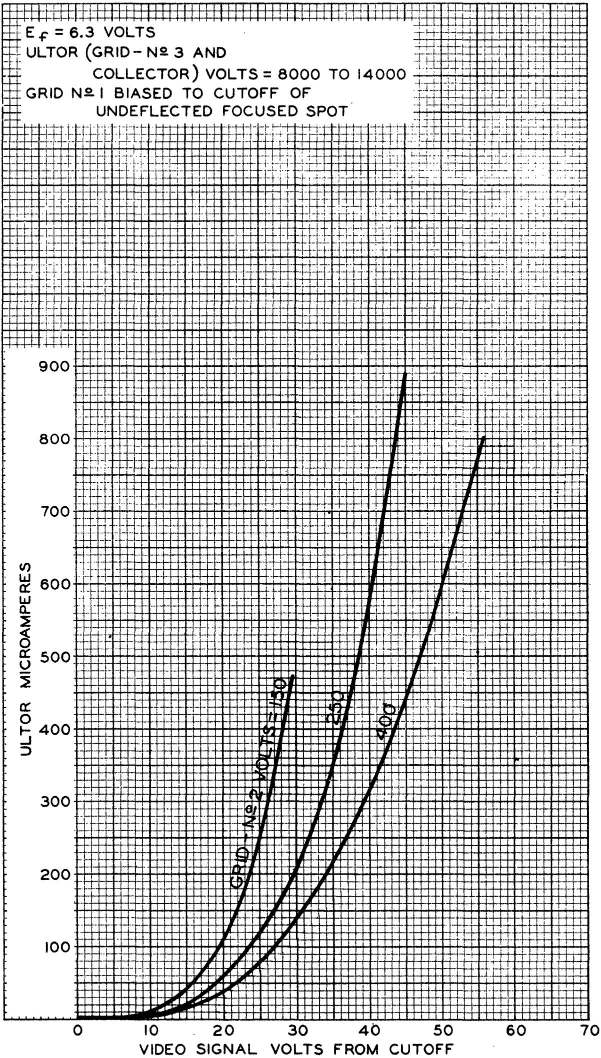
NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH METAL-SHELL AXIS AND HAVING DIAMETER OF 3".

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 ULTOR 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 . . {1300 max. pf; 800 min. pf}

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

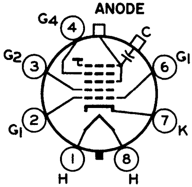
Optical:

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

Mechanical:

Weight (Approx.) . . . . 8-1/2 lbs
Overall Length . . . . 10-1/4" ± 1/4"
Neck Length. . . . . 4-1/8" ± 1/8"
Projected Area of Screen . . . . 125 sq. in.
External Conductive Coating:
Type . . . . Regular-Band
Contact area for grounding . . . . .Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J125 C2* sheets at front of this section
Cap. . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . . . . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No. B7-208)
Basing Designation for BOTTOM VIEW 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



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

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

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

ANODE VOLTAGE. . . . . {20000 max. volts; 12000 min. volts}

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
PICTURE TUBE
ROUND METAL-SHELL TYPE

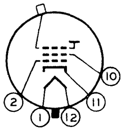
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

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

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



Metal-Shell Lip - Ultor (Grid No.3, Collector)

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

ULTOR VOLTAGE	14000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Maximum Circuit Values:

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

← Indicates a change.

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

16DP4-A
PICTURE TUBE

ROUND GLASS TYPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

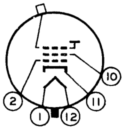
General:

Heater, for Unipotential Cathode:

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

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

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



Pin 12 - Heater
Cap▲ - Ultor (Grid No.3, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	15000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

Maximum Circuit Values:

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

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

← Indicates a change.

16GP4-B
PICTURE TUBE

ROUND METAL-SHELL TYPE

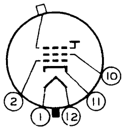
MAGNETIC FOCUS MAGNETIC DEFLECTION

DATA

General:

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

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



Metal-Shell Lip - Ultor (Grid No.3, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	14000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

Maximum Circuit Values:

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

← Indicates a change.

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

RCA

16LP4-A
PICTURE TUBE

ROUND GLASS TYPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

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

Capacitance between External Conductive Coating and Ultor . . . . { 2000 max. $\mu\mu f$ / 750 min. $\mu\mu f$ }

Faceplate, Spherical . . . . Filterglass

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

Deflection Angle (Approx.) . . . . 52°

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

Overall Length . . . . 22-1/4" ± 3/8"

Greatest Diameter of Bulb . . . . 15-7/8" ± 1/8"

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

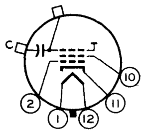
Operating Position . . . . Any

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

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

Basing Designation for BOTTOM VIEW 12N

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



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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	14000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period . . .	125 max.	volts
Heater positive with respect to cathode.	125 max.	volts

Maximum Circuit Values:

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

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

←Indicates a change.

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

16RP4A

Picture Tube

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC 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. .	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	

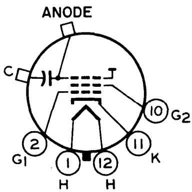
Optical:

Phosphor (For curves, see front of this Section). P4—Sulfide Type, Aluminized
Faceplate, 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

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

RCA

16TP4

PICTURE TUBE

RECTANGULAR GLASS TYPE

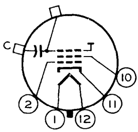
MAGNETIC FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp ←
Capacitance between External Conductive Coating and Ultor	2000 max.	$\mu\mu$f
	750 min.	$\mu\mu$f
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.

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

16TP4

PICTURE TUBE

PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	410 max.	volts
After equipment warm-up period . . .	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts

Maximum Circuit Values:

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

RCA

16WP4-A
PICTURE TUBE

ROUND GLASS TYPE

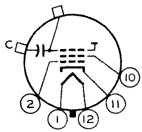
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp ←
Capacitance between External Conductive Coating and Ultor	1500 max. / 750 min.	$\mu\mu$f / $\mu\mu$f
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 — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 90° MAGNETIC DEFLECTION

GENERAL DATA

Electrical:

Direct Interelectrode Capacitances:
- Cathode to all other electrodes. . . . . 5 pf
- Grid No.1 to all other electrodes. . . . 6 pf
- External conductive coating to anode . . 1500 max. pf; 1000 min. pf

Heater Current at 6.3 volts. . . . . 600 ± 30 ma
Electron Gun . . . . .Type Requiring No Ion-Trap Magnet

Optical:

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

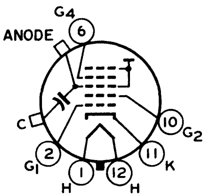
Mechanical: ←

Weight (Approx.) . . . . 15 lbs
Overall Length . . . . 14-5/8" ± 3/8"
Neck Length. 5-1/2" ± 3/16"
Projected Area of Screen . . . . 149 sq. in.
External Conductive Coating:
- Type . . . . Regular-Band
- Contact area for grounding . . . . Near Reference Line

For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J133 F/G* sheets at front of this section

Cap. . . . . Recessed Small Cavity (JEDEC No.J1-21)
Bases (Alternates):
- Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-63)
- Short Small-Shell Duodecal 6-Pin (JEDEC No.B6-203)
- Basing Designation for BOTTOM VIEW 12L

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



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

← Indicates a change.

→ **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.

Picture Tube

RECTANGULAR GLASS TYPE | **ALUMINIZED SCREEN**
MAGNETIC 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. . {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%

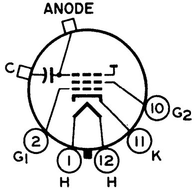
Mechanical:

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.

→ **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

Picture Tube

RECTANGULAR GLASS TYPE | **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS | **110° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Direct Interelectrode Capacitances:

Cathode to all other electrodes	5	pf
Grid No.1 to all other electrodes . . .	6	pf
External conductive coating to anode. .	1500 max.	pf
	800 min.	pf ←
Heater Current at 8.4 volts	450 ± 45	ma
Heater Warm-Up Time (Average)	11	seconds

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

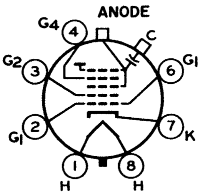
Optical:

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

Mechanical: ←

Weight (Approx.). . . . . 10 lbs
Overall Length. . . . . 12-9/16" + 1/4" − 9/16"
Neck Length . . . . 5-7/16" + 1/8" − 7/16"
Projected Area of Screen. . . . . 155 sq. in.
External Conductive Coating:
Type. . . . . .Regular-Band
Contact area for grounding. . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J132 1/2 A/B* sheets at front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Bases (Alternates):
Small-Button Eightar 7-Pin, Arrangement 2 (JEDEC No.B7-183)
Small-Button Neoeightar 7-Pin, Arrangement 1 (JEDEC No.B7-208)
Basing Designation for BOTTOM VIEW 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



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

← Indicates a change.

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

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

ANODE VOLTAGE	{17600 max. 11000 min.	volts volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	154 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	{6.9 max. 5.7 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode:		
Combined AC and DC voltage	200 max.	volts
DC component	100 max.	volts

Typical Operating Conditions for Grid-Drive Service:

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

Anode Voltage	16000	volts
Grid-No.4 Voltage	0 to 400	volts
Grid-No.2 Voltage	400	volts
Grid-No.1 Voltage for visual extinction of focused raster	-36 to -94	volts

Maximum Circuit Value:

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

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

→ Indicates a change.

RCA

17CP4
PICTURE TUBE

RECTANGULAR METAL-SHELL TYPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

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

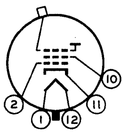
Faceplate, Spherical . . . . Frosted Filterglass
Phosphor (For curves, see front of this Section) . P4—Sulfide Type
Deflection Angles (Approx.):
- Diagonal . . . . 70°
- Horizontal . . . . 66°
- Vertical . . . . 50°

Electron Gun . . . . Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:
- Maximum overall length . . . . 19"
- Greatest width at lip . . . . 15-15/16" ± 1/8"
- Greatest height at lip . . . . 12-1/4" ± 1/8"
- Diagonal at lip . . . . 16-13/16" ± 3/16"
- Neck length . . . . 7-3/16" ± 3/16"
- Radius of curvature of faceplate (External surface) . . . . 30" ←

Screen Dimensions (Minimum):
- Greatest width . . . . 14-3/8"
- Greatest height . . . . 10-11/16"
- Diagonal . . . . 15-1/4"

Operating Position . . . . Any
Ultor Terminal . . . . Metal-Shell Lip
Base . . Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57) ←
- Basing Designation for BOTTOM VIEW . . . . 12D ←

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



Metal-Shell Lip - Ultor (Grid No.3, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

← Indicates a change.

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PICTURE TUBE

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Maximum Circuit Values:

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

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

Picture Tube

SHORT RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 110° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 5%	ma
Heater Warm-Up Time (Average)	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes . . .	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor. .	1400 max.	μμf
	900 min.	μμf

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

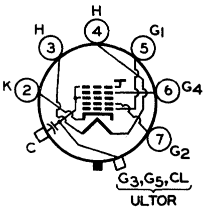
Optical:

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. . . . . 12-5/16" ± 5/16"
Neck Length . . . . 5-3/16" ± 3/16"
Projected Area of Screen. . . . . 155 sq. in.
External Conductive Coating:
Type. . . . . Modified Band
Contact area for grounding. . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines* and *Bulb J132-1/2 A/B* sheets at the front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . Special 6-Pin (JEDEC No.B6-185)
Basing Designation for BOTTOM VIEW. 7FA

Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Grid No.1
Pin 6 - Grid No.4
Pin 7 - Grid No.2



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

Maximum Ratings, *Design-Maximum Values:*

ULTOR VOLTAGE	17600 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value.	1100 max.	volts
Negative value.	550 max.	volts

GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	154 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	450 max.	volts
After equipment warm-up period. . . .	200 max.	volts
Heater positive with respect to cathode.	200 max.	volts

Typical Operating Conditions:

With ultor voltage of	*14000*	*volts*
and grid-No.2 voltage of	*300*	*volts*
Grid-No.4 Voltage for focus	-50 to +350	volts
Grid-No.1 Voltage for visual extinction of focused raster	-35 to -72	volts

Maximum Circuit Values:

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

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

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PICTURE TUBE

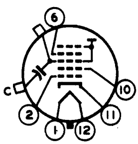
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	1500 max.	μμf
	1200 min.	μμf
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		79%
Phosphor (For curves, see front of this Section)		P4—Sulfide Type Aluminized
Fluorescence		White
Phosphorescence		White
Persistence		Medium-Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		90°
Horizontal		85°
Vertical		68°
Electron Gun		Type Requiring No Ion-Trap Magnet
Tube Dimensions:		
Overall length		15" ± 3/8"
Greatest width		15-5/8" ± 1/8"
Greatest height		12-3/4" ± 1/8"
Diagonal		16-9/16" ± 1/8"
Neck length		5-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)		20-3/4"
Screen Dimensions (Minimum):		
Greatest width		14-3/4"
Greatest height		11-11/16"
Diagonal		15-3/4"
Projected area		155 sq. in.
Weight (Approx.)		10 lbs
Operating Position		Any
Cap		Recessed Small Cavity (JEDEC No. J1-21)
Bulb		J132-1/2 C1/D1
Base		Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)
Basing Designation for BOTTOM VIEW		12L

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



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

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17CFP4
PICTURE TUBE

GRID-DRIVE▲ SERVICE

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

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

ULTOR VOLTAGE	16000	max.	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 (Ec_5k) between 12000✠ and 16000 volts and grid-No.2 voltage (Ec_2k) between 200 and 500 volts

Grid-No.4 Voltage for focus§	-50 to +350	volts
Grid-No.1 Voltage for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive From Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for Ec_1k except video drive is a positive voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*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

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PICTURE TUBE

Grid-No.1 Video Drive from Raster Cutoff (Black level):

White-level value.	28 to 72	volts

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

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

ULTOR-TO-GRID-No.1 VOLTAGE	16000	max.	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 (Ec_5g_1) between 12000⊕ and 16000 volts and grid-No.2-to-grid-No.1 voltage (Ec_2g_1) between 220 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (Ek_{g_1}) for visual extinction of focused raster.	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative).	Same value as determined for Ek_{g_1} except video drive is a negative voltage	
Grid-No.4 Current.	-25 to +25	µa

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PICTURE TUBE

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

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of.	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of.	*300*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus.	0 to 400	volts
Cathode-to-Grid No.1 Voltage for visual extinction of focused raster	28 to 60	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value.	-28 to -60	volts

Maximum Circuit Values:

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

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

✠ This value is a working design-center minimum. The equivalent *absolute minimum* ultor- or ultor-to-grid-No.1 voltage is 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.

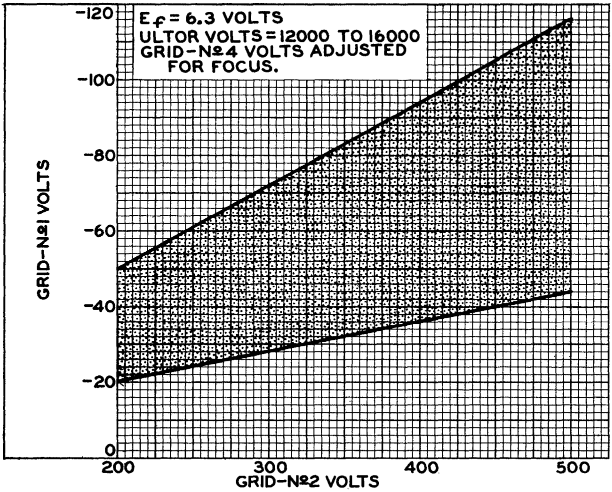
■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

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

17CFP4

RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



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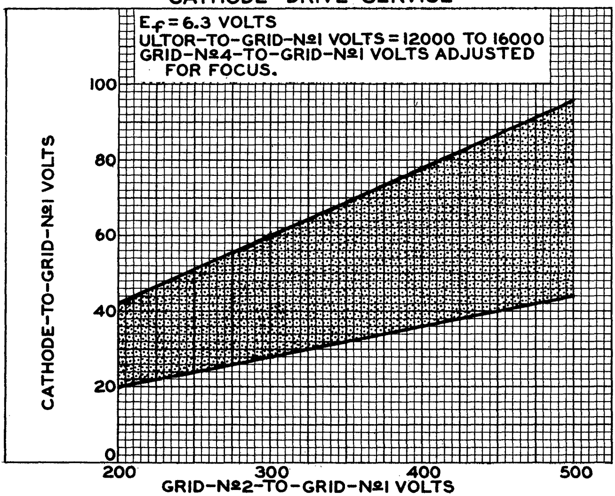
CATHODE-DRIVE SERVICE



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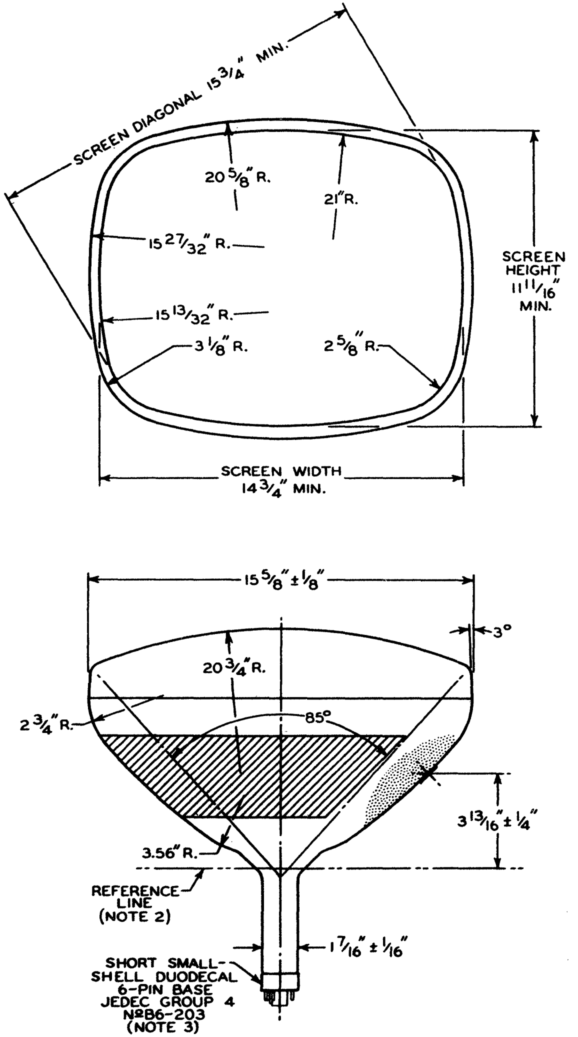
17CFP4

PICTURE TUBE



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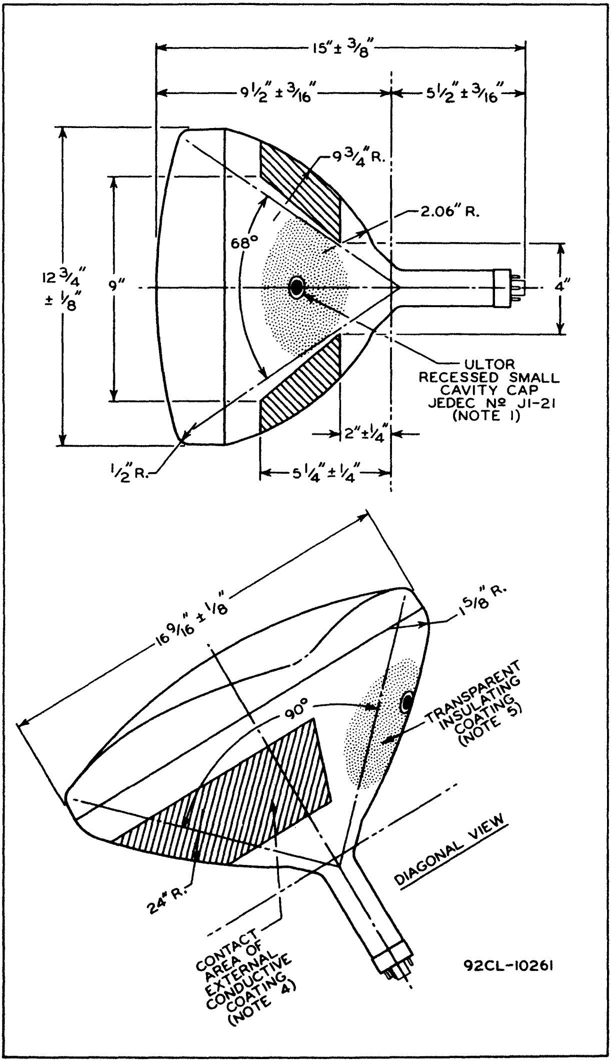
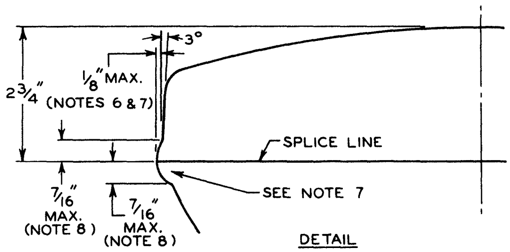
17CFP4

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 ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC′ OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUITRY CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: MEASURED 2-9/32" ± 1/32" FROM THE PLANE TANGENT TO THE SURFACE OF THE FACEPLATE AT THE TUBE AXIS.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/4", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/8" BEYOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMENSIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.

NOTE 8: THE TUBE SHOULD BE SUPPORTED ON BOTH SIDES OF THE BULGE. THE MECHANISM USED SHOULD PROVIDE CLEARANCE FOR THE MAXIMUM DIMENSIONS OF THE BULGE.

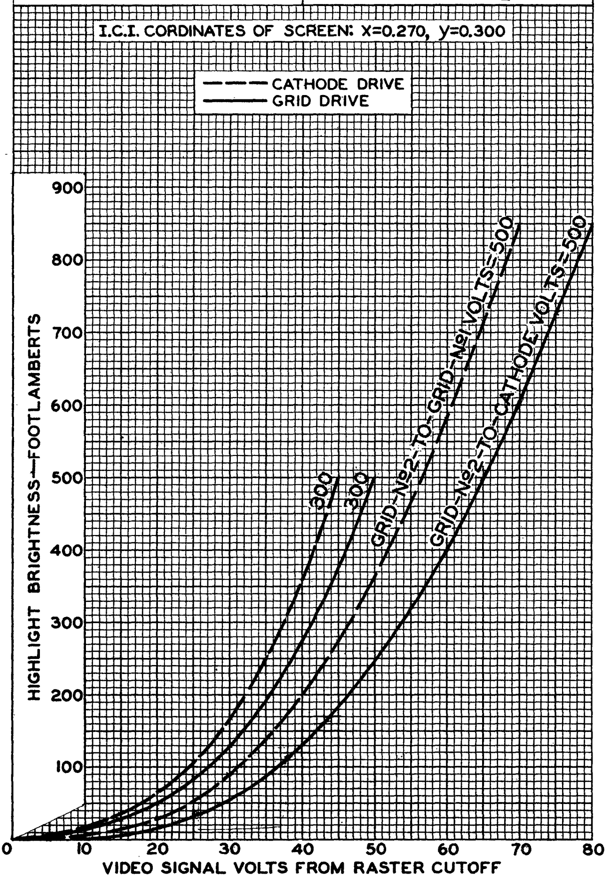
17CFP4

RCA

17CFP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-Nº1 VOLTS = 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID Nº1 TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS. RASTER SIZE = 14"x 10½"	E_f = 6.3 VOLTS ULTOR VOLTS = 16000 GRID Nº1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS. RASTER SIZE = 14"x 10½"



ELECTRON TUBE DIVISION

92CM-9241R1

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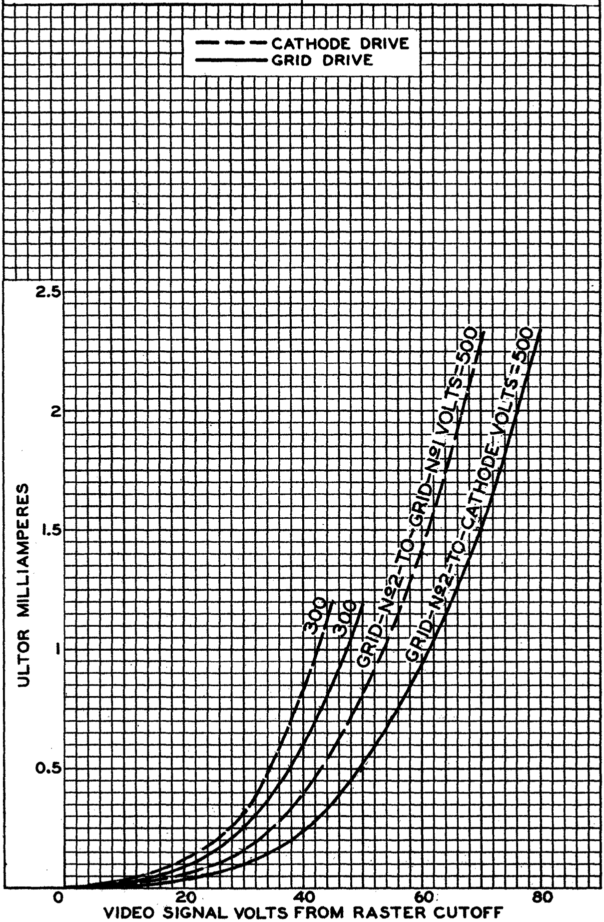
RCA

17CFP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
Ef = 6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS = 12000 TO 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	Ef = 6.3 VOLTS ULTOR VOLTS = 12000 TO 16000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



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

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

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

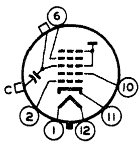
Focusing Method . . . . Electrostatic
Deflection Method . . . . Magnetic
Deflection Angles (Approx.):
- Diagonal . . . . 90°
- Horizontal . . . . 85°
- Vertical . . . . 68°

Electron Gun . . . . Type Requiring No Ion-Trap Magnet
Tube Dimensions:
- Overall length . . . . 14" ± 3/8"
- Greatest width . . . . 15-5/8" ± 1/8"
- Greatest height . . . . 12-3/4" ± 1/8"
- Diagonal . . . . 16-9/16" ± 1/8"
- Neck length . . . . 4-1/2" ± 3/16"
- Radius of curvature of faceplate (External surface) . . 20-3/4"

Screen Dimensions (Minimum):
- Greatest width . . . . 14-3/4"
- Greatest height . . . . 11-11/16"
- Diagonal . . . . 15-3/4"
- Projected area . . . . 155 sq. in.

Weight (Approx.) . . . . 10 lbs
Operating Position . . . . Any
Cap . . . . Recessed Small Cavity (JEDEC No.J1-21)
Bulb J132-1/2 C1/D1
Base . . . . Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)
- Basing Designation for BOTTOM VIEW 12L

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



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

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17CYP4
PICTURE TUBE

GRID-DRIVE▲ SERVICE

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

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

ULTOR VOLTAGE	16000	max.	volts
	12000✱	min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:			
Positive value	1000	max.	volts
Negative value	500	max.	volts
GRID-No.2 VOLTAGE	500	max.	volts
GRID-No.1 VOLTAGE:			
Negative-peak value	200	max.	volts
Negative-bias value	140	max.	volts
Positive-bias value	0	max.	volts
Positive-peak value	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds	410	max.	volts
After equipment warm-up period	180	max.	volts
Heater positive with respect to cathode	180	max.	volts

Equipment Design Ranges:

With any ultor voltage (Ec_5k) between 12000✱ and 16000 volts and grid-No.2 voltage ($E_{c_2}k$) between 200 and 500 volts

Grid-No.4 Voltage for focus●	-50 to +350	volts
Grid-No.1 Voltage (Ec_1k) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for Ec_1k except video drive is a positive voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*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

ELECTRON TUBE DIVISION
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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	16000	max.	volts
	12000✠	min.	volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:			
Positive value	1000	max.	volts
Negative value	500	max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	640	max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500	max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:			
Positive-peak value	200	max.	volts
Positive-bias value	140	max.	volts
Negative-bias value	0	max.	volts
Negative-peak value	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds	410	max.	volts
After equipment warm-up period	180	max.	volts
Heater positive with respect to cathode	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) between 12000✠ and 16000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 225 and 640 volts

Grid-No.4-To-Grid-No.1 Voltage for focus§	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (Ekg_1) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for Ekg_1 except video drive is a negative value	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

ELECTRON TUBE DIVISION
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17CYP4

PICTURE TUBE

Example of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus.	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster.	28 to 60	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value.	-28 to -60	volts

Maximum Circuit Values:

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

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

⊕ This value is a working design minimum. The equivalent ***absolute minimum*** ultor (or ultor-to-grid-No.1) voltage is 11,000 volts, below which the serviceability of the 17CYP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor (or ultor-to-grid-No.1) voltage is never less than 11,000 volts.

♦ The grid-No.4 voltage required for optimum focus of any individual tube will have a value between -50 and +350 volts independent of ultor current and will remain essentially constant for values of ultor voltage or grid-No.2 voltage within design ranges shown for these items.

§ The grid-No.4-to-grid-No.1 voltage required for optimum focus of any individual tube will have a value between 0 and 400 volts independent of ultor current and will remain essentially constant for values of ultor-to-grid-No.1 or grid-No.2-to-grid-No.1 voltage within design ranges shown for these items.

* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

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

OPERATING CONSIDERATIONS

Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 17CYP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

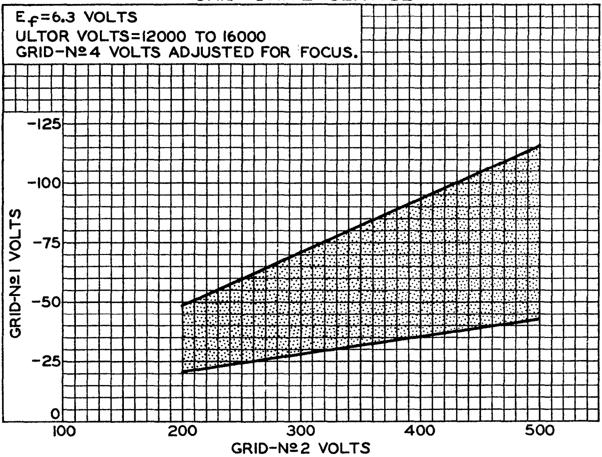
For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

17CYP4

17CYP4

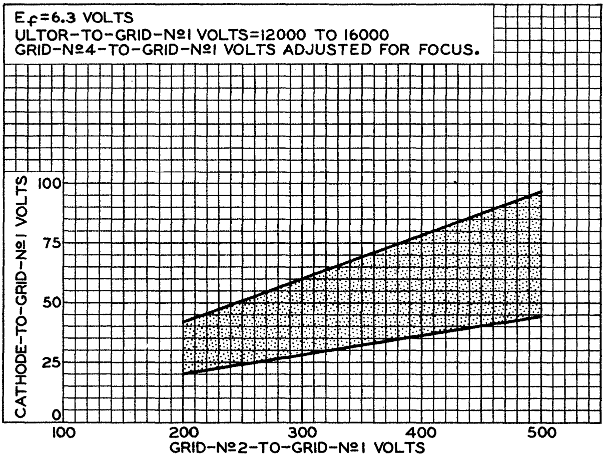
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



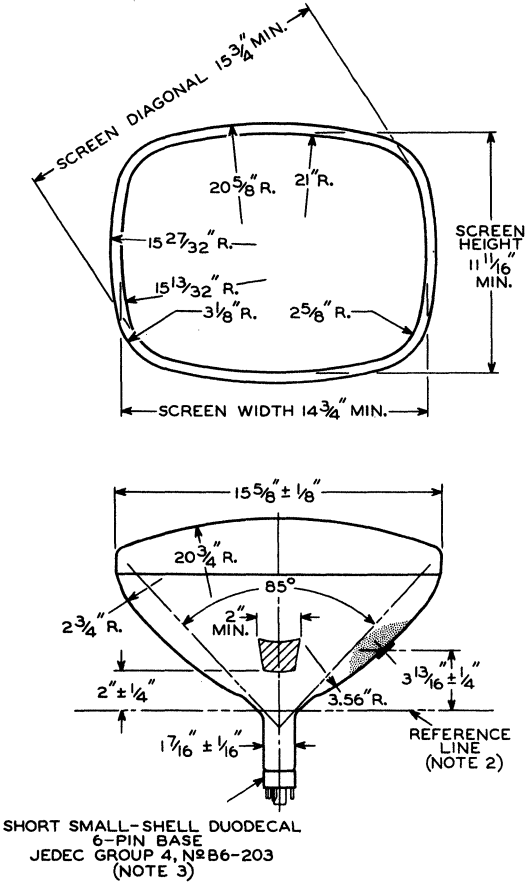
92CS-10385

CATHODE-DRIVE SERVICE

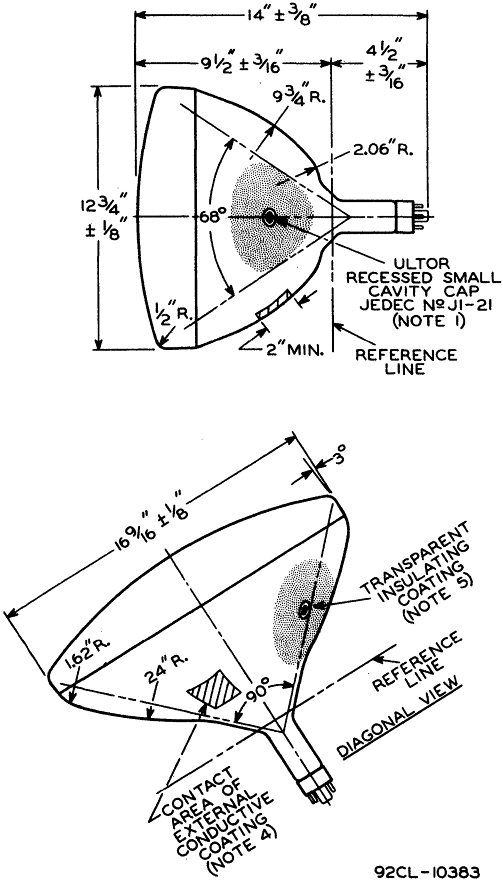


92CS-10384

17CYP4
PICTURE TUBE

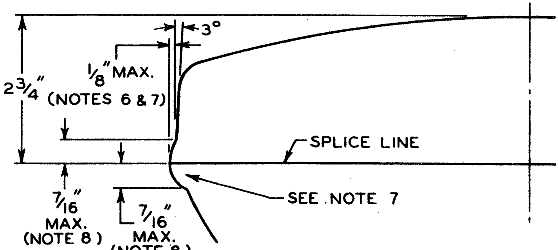


17CYP4
PICTURE TUBE



17CYP4

17CYP4
PICTURE TUBE



DETAIL OF PANEL

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

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: MEASURED 2-9/32" ± 1/32" FROM THE PLANE TANGENT TO THE SURFACE OF THE FACEPLATE AT THE TUBE AXIS.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/4", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/8" BEYOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMENSIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.

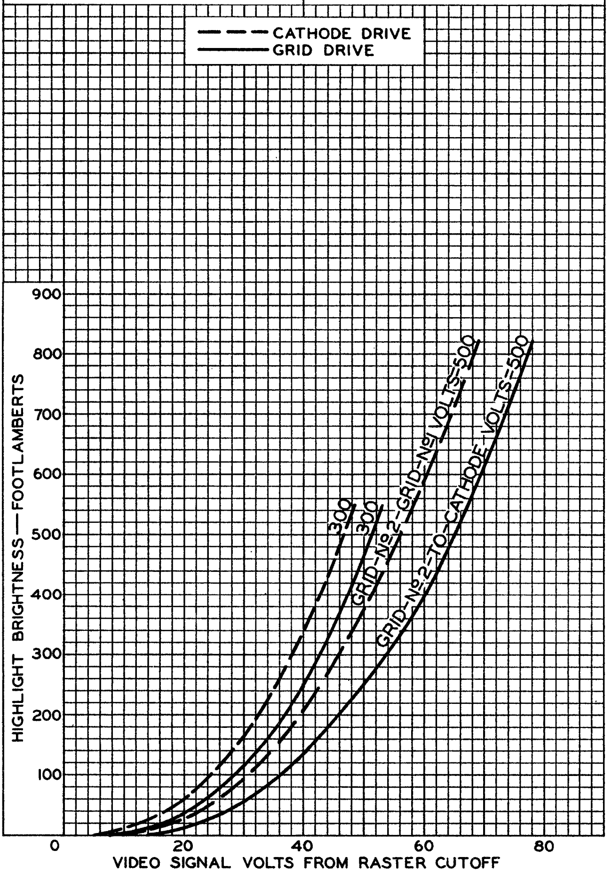
NOTE 8: THE TUBE SHOULD BE SUPPORTED ON BOTH SIDES OF THE BULGE. THE MECHANISM USED SHOULD PROVIDE CLEARANCE FOR THE MAXIMUM DIMENSIONS OF THE BULGE.

RCA

17CYP4

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 = 14" x 10 1/2"	RASTER SIZE = 14" x 10 1/2"

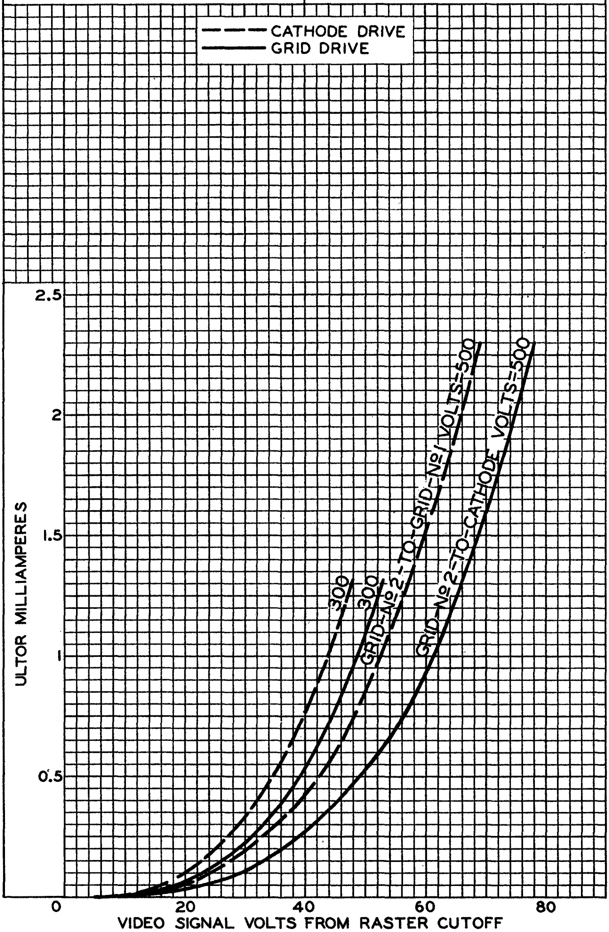


RCA

17CYP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f=6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS=12000 TO 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f=6.3 VOLTS ULTOR VOLTS=12000 TO 16000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



ELECTRON TUBE DIVISION 92CM-10387

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17DAP4

RCA 17DAP4 PICTURE TUBE

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

With heater having controlled warm-up time

DATA

General:

Heater, for Unipotential Cathode:

Voltage (AC or DC)	2.68 ± 10%	volts
Current at 2.68 volts	0.45	amp
Warm-up time (Average)	11	sec

Capacitance between External Conductive Coating and Ultor: 1400 max. $\mu\mu f$; 900 min. $\mu\mu f$

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.

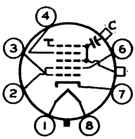
Operating Position . . . . . Any

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

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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

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

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17DKP4
PICTURE TUBE

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

With heater having controlled warm-up time

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

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

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes	6	$\mu\mu f$
Cathode to all other electrodes	5	$\mu\mu f$
External conductive coating to ultor	1500 max.	$\mu\mu f$
	1000 min.	$\mu\mu f$

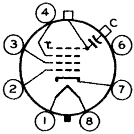
Faceplate, Spherical . . . . .Filterglass
  Light transmission (Approx.) 76%
Phosphor (For curves, see front of this Section) . P4—Sulfide Type Aluminized
  Fluorescence . . . . .White
  Phosphorescence. .White
    Persistence. . . . . .Short
Focusing Method. . . . . .Electrostatic
Deflection Method. Magnetic
Deflection Angles (Approx.):
  Diagonal . . . . 110°
  Horizontal . . . . 105°
  Vertical . . . . 87°
Electron Gun . . . . .Type Requiring No Ion-Trap Magnet
Tube Dimensions:
  Overall length . . . . 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▲ SERVICE

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

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

ULTOR VOLTAGE	16000	max.	volts
	12000✠	min.	volts
GRID-No.3 VOLTAGE	650	max.	volts
GRID-No.2 VOLTAGE	550	max.	volts
	300	min.	volts
GRID-No.1 VOLTAGE:			
Negative-peak value	200	max.	volts
Negative-bias value	140	max.	volts
Positive-bias value	0	max.	volts
Positive-peak value	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds.	410	max.	volts
After equipment warm-up period. . . .	180	max.	volts
Heater positive with respect to cathode .	180	max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c_4k}) between 12000 and 16000 volts and grid-No.2 voltage (E_{c_2k}) between 400 and 550 volts

Grid-No.3 Voltage for focus§.	0 to 400	volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.3 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa

17DKP4

PICTURE TUBE

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.	volts
	12000✠	min.	volts
GRID-No. 3-TO-GRID-No. 1 VOLTAGE.	650	max.	volts
GRID-No. 2-TO-GRID-No. 1 VOLTAGE.	690	max.	volts
GRID-No. 2-TO-CATHODE VOLTAGE.	550	max.	volts
	300	min.	volts
CATHODE-TO-GRID-No. 1 VOLTAGE:			
Positive-peak value	200	max.	volts
Positive-bias value	140	max.	volts
Negative-bias value	0	max.	volts
Negative-peak value	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds.	410	max.	volts
After equipment warm-up period. . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No. 1 voltage ($E_{c_4g_1}$) between 12000 and 16000 volts and grid-No. 2-to-grid-No. 1 voltage ($E_{c_2g_1}$) between 400 and 690 volts

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

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PICTURE TUBE

Cathode-to-Grid-No.1 Voltage (E_{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		μa
Grid-No.2 Current.	-15 to +15		μa
Field Strength of Adjustable Centering Magnet● . .	0 to 12		gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No. 1 voltage of	*16000*	*16000*	*volts*
and grid-No. 2-to-grid-No. 1 voltage of	*400*	*500*	*volts*
Grid-No.3-to-Grid-No.1 Voltage for focus.	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	34 to 56	41 to 69	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value.	-34 to -56	-41 to -69	volts

Maximum Circuit Values:

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

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

✠ This value is a working design-center minimum. The equivalent *absolute minimum* ultor- or ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 17DKP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor- or ultor-to-grid-No.1 voltage is never less than 11,000 volts.

§ The grid-No.3 voltage required for optimum focus of any individual tube may have a value anywhere between 0 and 400 volts and is a function of the value of the ultor voltage, ultor current, and grid-No.2 voltage. It changes directly with the ultor voltage at the rate of approximately 46 volts for each 1000-volt change in ultor voltage; inversely with grid-No.2 voltage at the rate of about 60 volts for each 100-volt change in grid-No.2 voltage; and inversely with ultor current at the rate of about 60 volts for each 100-microampere change in ultor current. Because the 17DKP4 has a narrow depth of focus, it is necessary to

17DKP4

PICTURE TUBE

provide means such as a potentiometer or a 4-tap switch for adjusting the focusing voltage. In general, commercially acceptable focus is obtained if the focusing voltage is within 75 volts of the value required for optimum focus and if the focusing voltage is maintained to within 75 volts of the optimum value during line-voltage fluctuations.

Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 5/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

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

OPERATING CONSIDERATIONS

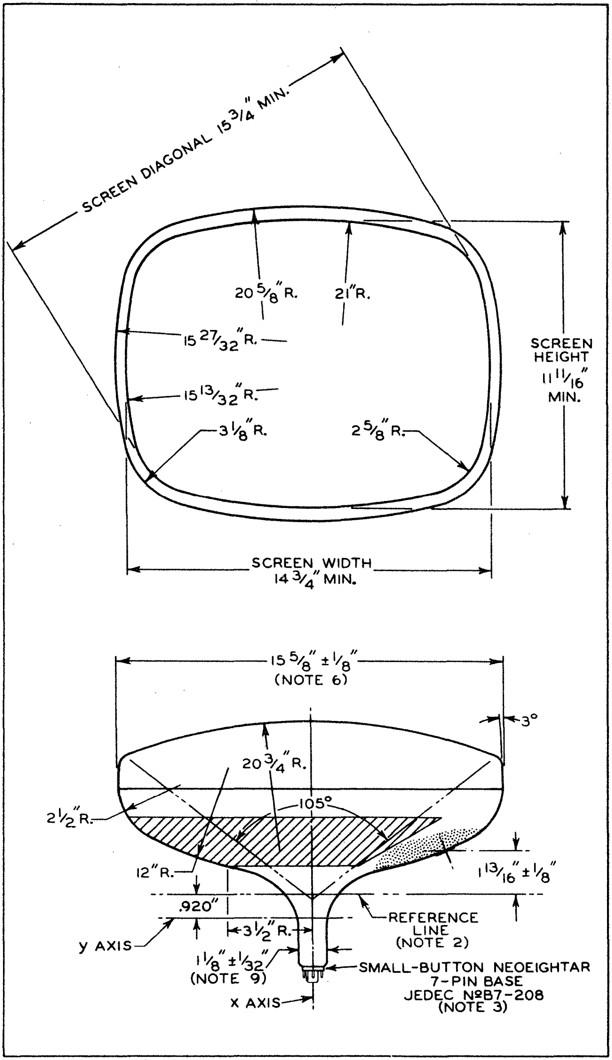
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 17DKP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

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

RCA

17DKP4

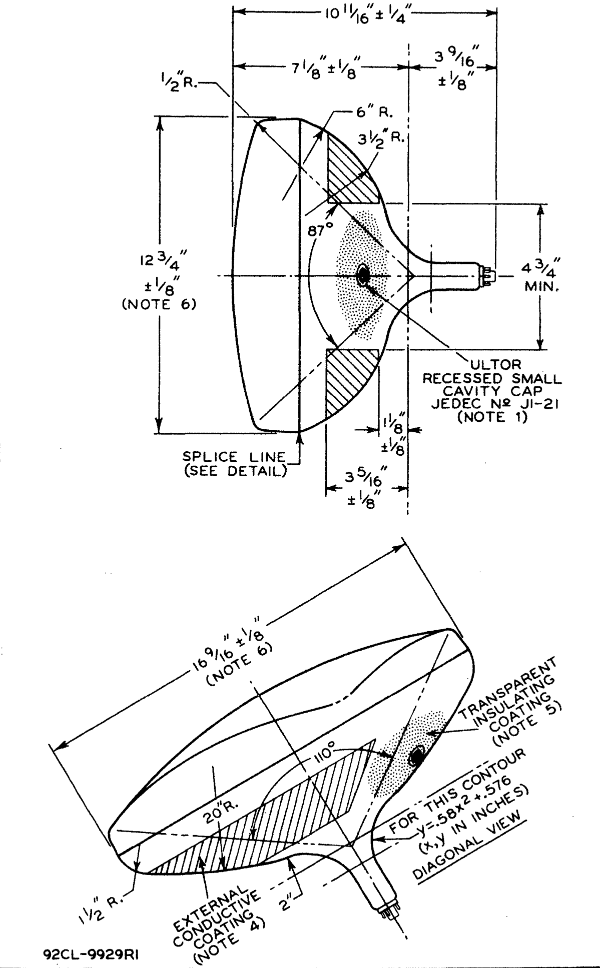
PICTURE TUBE



RCA

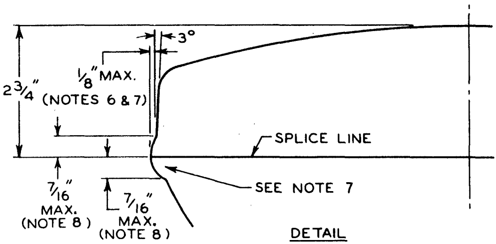
17DKP4

PICTURE TUBE



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 ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-126 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: MEASURED 2-9/32" ± 1/32" FROM THE PLANE TANGENT TO THE SURFACE OF THE FACEPLATE AT THE TUBE AXIS.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/4", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/8" BEYOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMENSIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.

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

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

RCA

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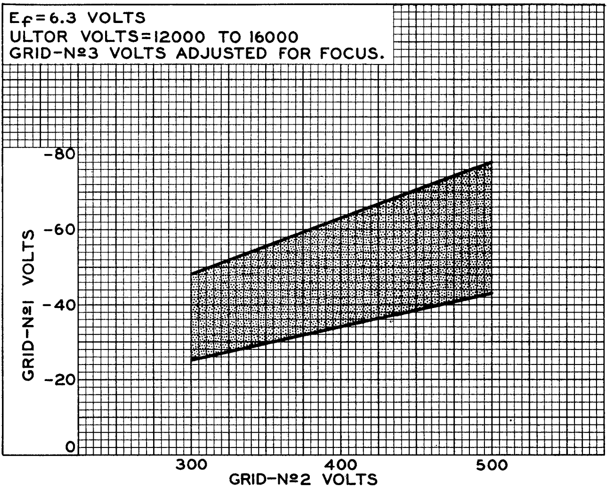
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



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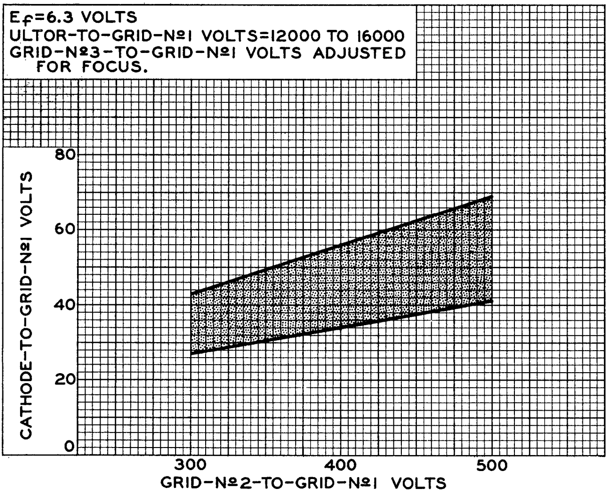
CATHODE-DRIVE SERVICE



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17DKP4

RCA

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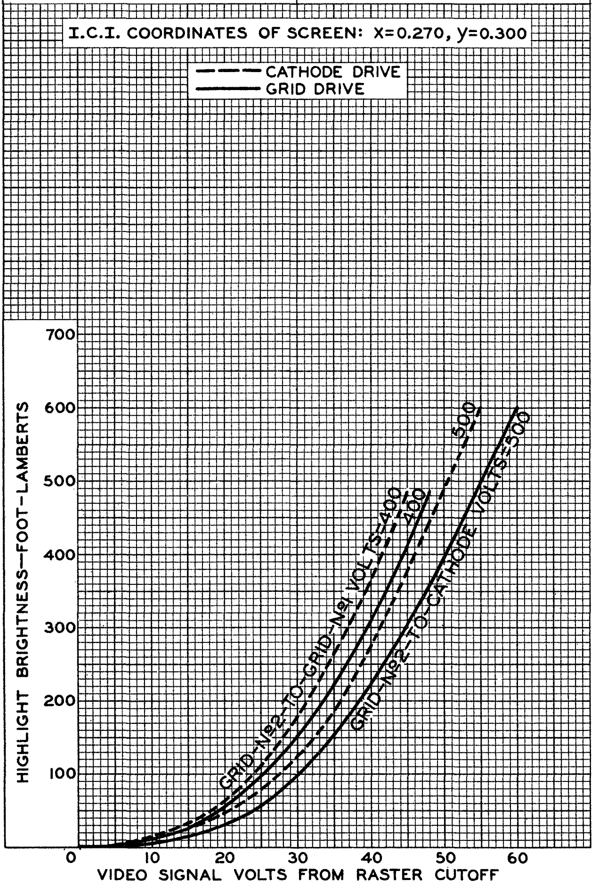
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 14"x 10½"	RASTER SIZE = 14"x 10½"



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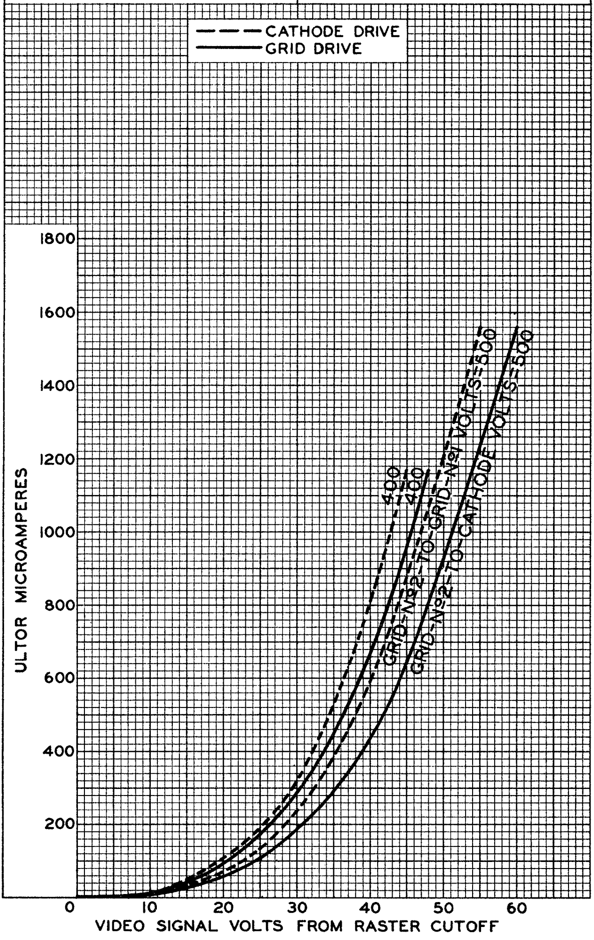
17DKP4

AVERAGE DRIVE CHARACTERISTICS

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



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92CM-9932

Picture Tube

SHORT RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 110° MAGNETIC DEFLECTION
LOW GRID-No.2 VOLTAGE — CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts.	450 ± 5%	ma
Heater Warm-Up Time (Average).	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes. . .	6	μμf
Cathode to all other electrodes. . . .	5	μμf
External conductive coating to ultor .	1700 max.	μμf
	1200 min.	μμf
Electron Gun	Type Requiring No Ion-Trap Magnet	

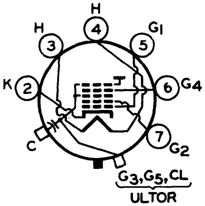
Optical:

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 *Picture-Tube Dimensional-Outlines* and *Bulb J132-1/2 A/B* sheets at the front of this section
Cap. . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . . . .Special 6-Pin (JEDEC No.B6-214)
Basing Designation for BOTTOM VIEW 7FA

Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Grid No.1
Pin 6 - Grid No.4
Pin 7 - Grid No.2



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

17DQP4

Maximum Ratings, *Design-Maximum Values:*

ULTOR-TO-GRID-No.1 VOLTAGE.	17600 max.	volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value.	1100 max.	volts
Negative value.	550 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	70 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	150 max.	volts
Negative peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	450 max.	volts
After equipment warm-up period. . .	200 max.	volts
Heater positive with respect to cathode.	200 max.	volts

Typical Operating Conditions:

With ultor-to-grid-No.1 voltage of	*14500*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*50*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	-200 to +350	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster .	31 to 49	volts

Maximum Circuit Values:

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

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

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.	pf
	900 min.	pf
Heater Current at 2.68 volts	450 ± 45	ma
Heater Warm-Up Time (Average).	11	seconds

Electron Gun . . . . .Type Requiring No Ion-Trap Magnet

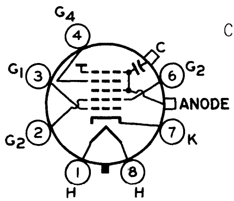
Optical:

Phosphor (For curves, see front of this Section). .P4—Sulfide Type, Aluminized
Faceplate, Spherical . . . . .Filterglass
Light transmission (Approx.) 77%

Mechanical:

Weight (Approx.) . . . . 10 lbs
Overall Length . . . . 10-13/16" ± 3/16"
Neck Length. . . . . 3-11/16" ± 1/16"
Projected Area of Screen . . . . 155 sq. in.
External Conductive Coating:
Type . . . . Modified-Band
Contact area for grounding . . . . .Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J132-1/2 A/B* sheets at front of this section
Cap. . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . . . . .Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)
Basing Designation for BOTTOM VIEW 8JK

Pin 1 - Heater
Pin 2 - Grid No.2
Pin 3 - Grid No.1
Pin 4 - Grid No.4
Pin 6 - Grid No.2
Pin 7 - Cathode
Pin 8 - Heater



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

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

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

ANODE VOLTAGE	17600 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	950 max.	volts
Negative value	700 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	400 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	2.9 max. 2.4 min.	volts volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode:		
Combined AC and DC voltage	200 max.	volts
DC component	100 max.	volts

Typical Operating Conditions for Grid-Drive Service:

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

Anode Voltage	14000	volts
Grid-No.4 Voltage	100 to 500	volts
Grid-No.2 Voltage	300	volts
Grid-No.1 Voltage for visual extinction of focused raster	-35 to -72	volts

Maximum Circuit Value:

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

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

17DSP4
PICTURE TUBE

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

With heater having controlled warm-up time

DATA

General:

Heater, for Unipotential Cathode:

Voltage (AC or DC)	6.3	volts
Current	0.6	amp
Warm-up time (Average)	11	sec

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	1500 max.	μμf
	1000 min.	μμf

Faceplate, Spherical	Filterglass
Light transmission (Approx.)	78%
Phosphor (For curves, see front of this section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Medium-Short
Focusing Method	Electrostatic
Deflection Method	Magnetic

Deflection Angles (Approx.):

Diagonal	110°
Horizontal	105°
Vertical	87°
Electron Gun	Type Requiring No Ion-Trap Magnet

Tube Dimensions:

Overall length	11-1/4" ± 3/16"
Greatest width	15-5/8" ± 1/8"
Greatest height	12-3/4" ± 1/8"
Diagonal	16-9/16" ± 1/8"
Neck length	4-1/8" ± 1/8"
Radius of curvature of faceplate (External surface)	20-3/4"

Screen Dimensions (Minimum):

Greatest width	14-3/4"
Greatest height	11-11/16"
Diagonal	15-3/4"
Projected area	155 sq. in.
Weight (Approx.)	10 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Bulb	J132-1/2 A1/B1
Socket	Ucinite Part No.115446, or equivalent

17DSP4

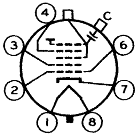
17DSP4

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 (Ec_5k) between 12000# and 18000 volts and grid-No.2 voltage (Ec_2k) between 200 and 500 volts

Grid-No.4 Voltage for focus§. . . . . 0 to 400 volts

Grid-No.1 Voltage (Ec_1k) for visual extinction of focused raster . . . . *See Raster-Cutoff-Range Chart for Grid-Drive Service*

Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive) . . . . Same value as determined for Ec_1k except video drive is a positive voltage

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PICTURE TUBE

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

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*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	−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

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17DSP4
PICTURE TUBE

Equipment Design Ranges:

With any ultor-to-grid-No. 1 voltage (Ec_5g_1) between 12000⊕ and 18000 volts and grid-No. 2-to-grid-No. 1 voltage (Ec_2g_1) between 225 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (Ek_{g_1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for Ek_{g_1} except video drive is a negative value	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No. 1 voltage of	*16000*	*16000*	*volts*
and grid-No. 2-to-grid-No. 1 voltage of	*300*	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster. . .	35 to 63	43 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	-35 to -63	-43 to -78	volts

Maximum Circuit Values:

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

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

⊕ This value is a working design-center minimum. The equivalent *absolute minimum* ultor (or ultor-to-grid-No.1) voltage is 11,000 volts, below which the serviceability of the 17DSP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor (or ultor-to-grid-No.1) voltage is never less than 11,000 volts.

§ The grid-No.4 (or grid-No.4-to-grid-No.1) voltage required for optimum focus of any individual tube will have a value between 0 and 400 volts independent of ultor current and will remain essentially constant for values of ultor (or ultor-to-grid-No.1) voltage or grid-No.2 (or grid-No.2-to-grid-No.1) voltage within design ranges shown for these items.

17DSP4

PICTURE TUBE

* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/8". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 5/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

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

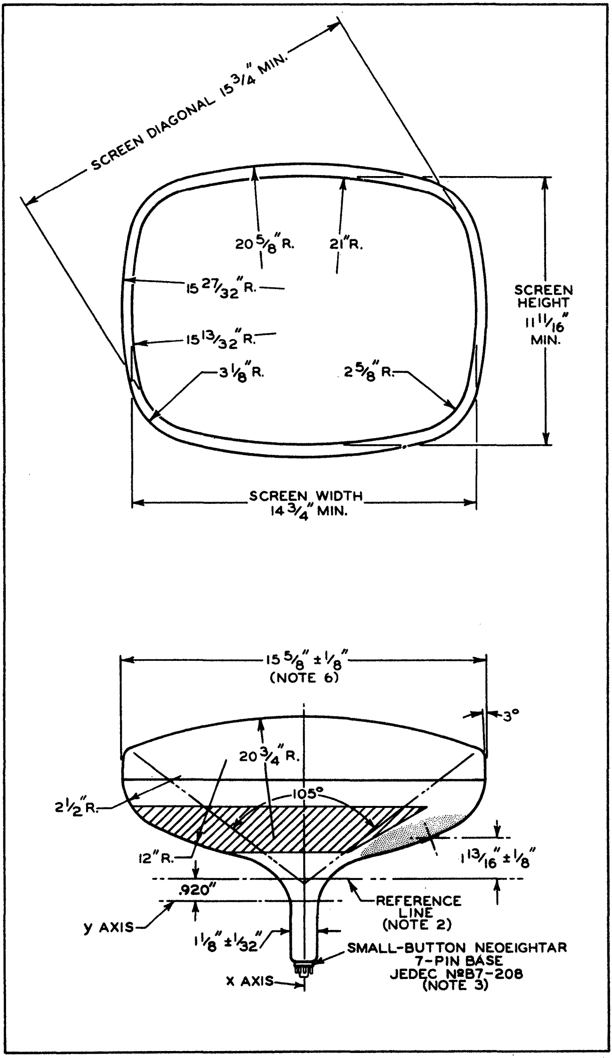
OPERATING CONSIDERATIONS

Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 17DSP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

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

17DSP4

PICTURE TUBE



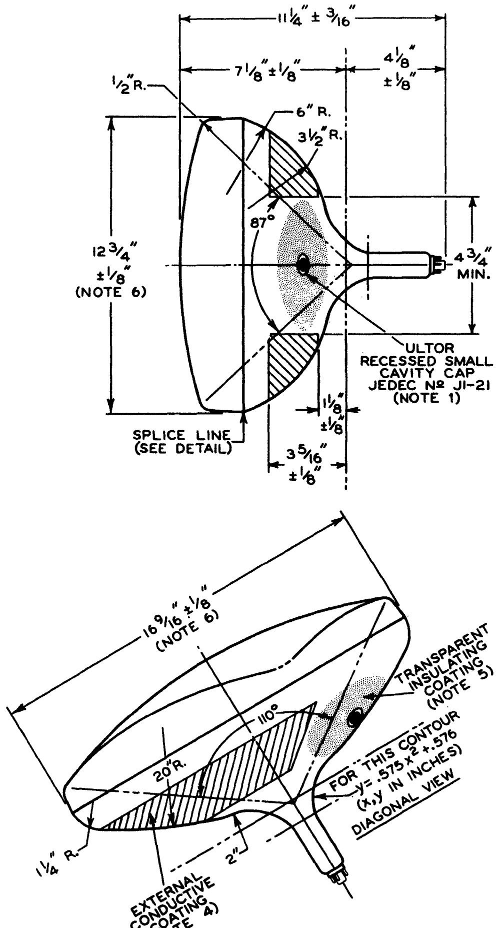
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE–10375A

RCA

17DSP4

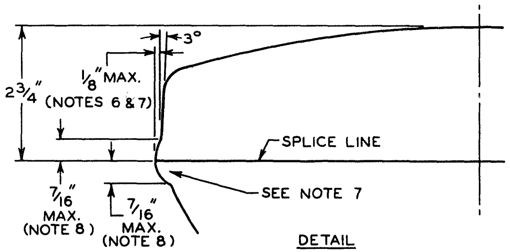
PICTURE TUBE



92CL-10375

RCA

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 ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-126 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: MEASURED 2-9/32" ± 1/32" FROM THE PLANE TANGENT TO THE SURFACE OF THE FACEPLATE AT THE TUBE AXIS.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/4", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/8" BEYOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMENSIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.

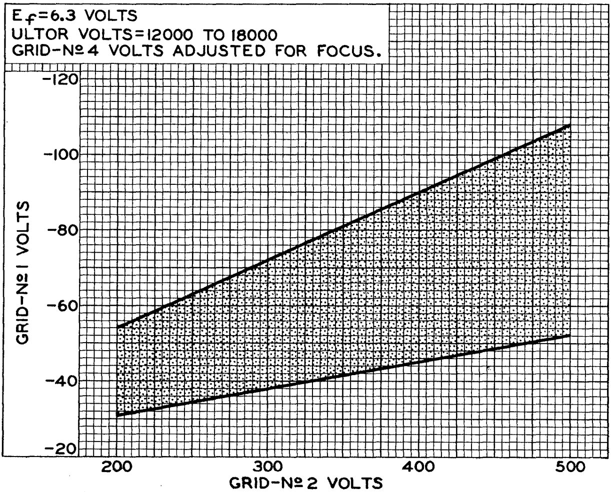
NOTE 8: THE TUBE SHOULD BE SUPPORTED ON BOTH SIDES OF THE BULGE. THE MECHANISM USED SHOULD PROVIDE CLEARANCE FOR THE MAXIMUM DIMENSIONS OF THE BULGE. SUPPORTS MUST BE SPACED FROM THE TUBE BY THE USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

RCA

17DSP4

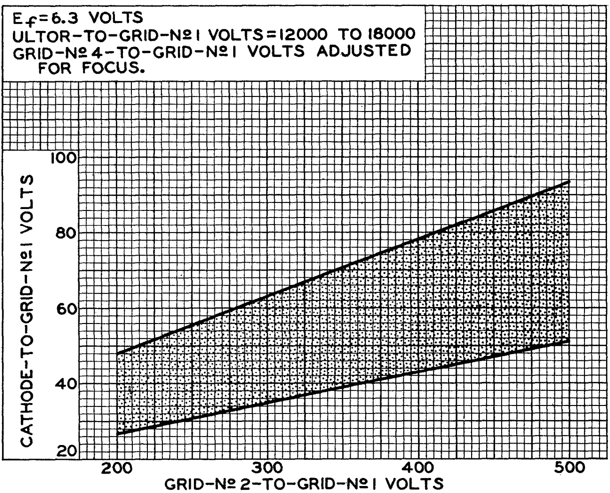
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



92CS-10376

CATHODE-DRIVE SERVICE



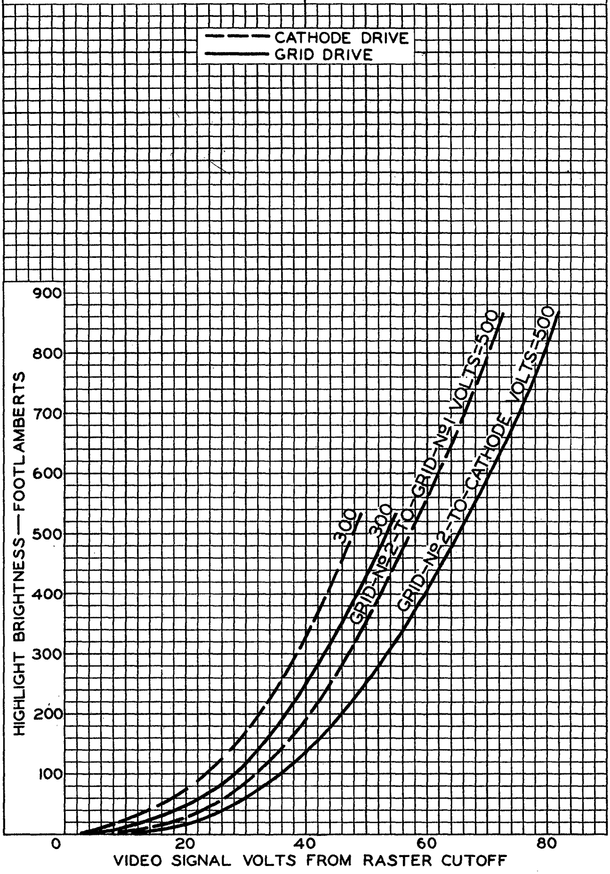
92CS-10377

17DSP4

17DSP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-Nº1 VOLTS = 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID Nº1 TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS. RASTER SIZE = 14" x 10 1/2"	E_f = 6.3 VOLTS ULTOR VOLTS = 16000 GRID Nº1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS. RASTER SIZE = 14" x 10 1/2"



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

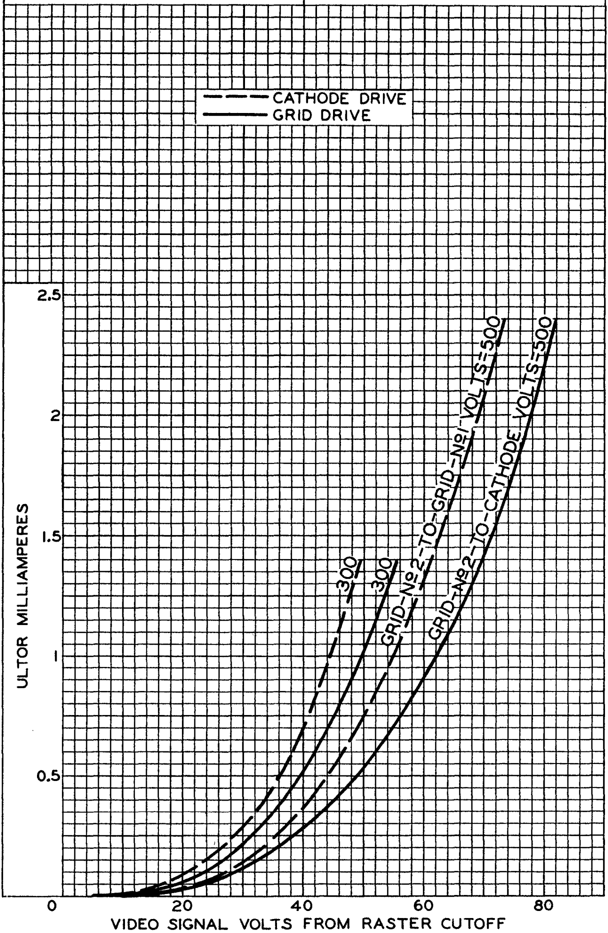
92CM-10380

RCA

17DSP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f=6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS=12000 TO 18000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f=6.3 VOLTS ULTOR VOLTS=12000 TO 18000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



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

92CM-10382

Picture Tube

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

GENERAL DATA

Electrical:

Heater Current at 6.3 volts . . . . 600 ± 10% ma
Direct Interelectrode Capacitances:
  Grid No.1 to all other electrodes . . . . . 6.5 μμf
  Cathode to all other electrodes . . . . . . 5 μμf
  External conductive coating to ultor. . . . {1500 max. μμf / 750 min. μμf}
Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

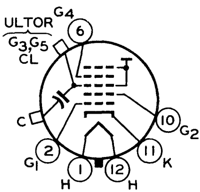
Optical:

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 — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION
With Heater Having Controlled Warm-Up Time

DATA

General:

Heater, for Unipotential Cathode:
- Voltage (AC or DC) . . . . 6.3 volts
- Current at 6.3 volts. . . . . 0.45 amp
- Warm-up time (Average). . . . . 11 sec

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . 6 μμf
- Cathode to all other electrodes . . . . 5 μμf
- External conductive coating to ultor. . {1500 max. μμf / 1000 min. μμf}

Faceplate, Spherical. . . . . Filterglass
- Light transmission (Approx.). 77%

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

Focusing Method . . . . Electrostatic
Deflection Method .Magnetic
Deflection Angles (Approx.):
- Diagonal. . . . . 110°
- Horizontal. . . . . 105°
- Vertical. . . . . 87°

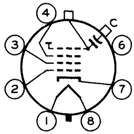
Electron Gun. . . . . Type Requiring No Ion-Trap Magnet
Tube Dimensions:
- Overall length. . . . . 10-11/16" ± 1/4"
- Greatest width. . . . . 15-5/8" ± 1/8"
- Greatest height . . . . 12-3/4" ± 1/8"
- Diagonal. . . . . 16-9/16" ± 1/8"
- Neck length . . . . 3-9/16" ± 1/8"
- Radius of curvature of faceplate (External surface). . . . . 20-3/4"

Screen Dimensions (Minimum):
- Greatest width. 14-3/4"
- Greatest height . . . . 11-11/16"
- Diagonal. . . . . 15-3/4"
- Projected area. . . . . 155 sq. in.

Weight (Approx.). . . . . 10 lbs
Operating Position. . . . . Any
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Bulb. . . . . .J132-1/2 A/B
Socket. . . . . Ucinite Part No.115446, or equivalent
Base. . . . . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)

Basing Designation for BOTTOM VIEW. 8JR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.3
Pin 6 - Internal Connection— Do Not Use
Pin 7 - Cathode



Pin 8 - Heater
Cap - Ultor (Grid No.4, Collector)
C - External Conductive Coating

GRID-DRIVE▲ SERVICE

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

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

ULTOR VOLTAGE.	16000	max.	volts
	12000♣	min.	volts
GRID-No.3 (FOCUSING) VOLTAGE	650	max.	volts
GRID-No.2 VOLTAGE.	550	max.	volts
	300	min.	volts
GRID-No.1 VOLTAGE:			
Negative-peak value.	200	max.	volts
Negative-bias value.	140	max.	volts
Positive-bias value.	0	max.	volts
Positive-peak value.	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds	410	max.	volts
After equipment warm-up period . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor voltage ($E_{c_4}k$) between 12000 and 16000 volts and grid-No.2 voltage ($E_{c_2}k$) between 400 and 550 volts

Grid-No.3 Voltage for focus§	0 to 400	volts
Grid-No.1 Voltage ($E_{c_1}k$) for visual extinction of focused raster.	See *Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive).	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.3 Current.	-25 to +25	μa
Grid-No.2 Current.	-15 to +15	μa

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

Examples of Use of Design Ranges:

With ultor voltage of	*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.	volts
	12000✠	min.	volts
GRID-No.3-TO-GRID-No.1 (FOCUSING) VOLTAGE	650	max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	690	max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	550	max.	volts
	300	min.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:			
Positive-peak value	200	max.	volts
Positive-bias value	140	max.	volts
Negative-bias value	0	max.	volts
Negative-peak value	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds.	410	max.	volts
After equipment warm-up period. . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_4g_1}$) between 12000 and 16000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 400 and 690 volts

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

17DXP4

Cathode-to-Grid-No.1 Voltage (Ek_{g_1}) for visual extinction of focused raster.	See *Raster-Cutoff-Range Chart for Cathode-Drive Service*		
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for Ek_{g_1} except video drive is a negative voltage		
Grid-No.3 Current	-25 to +25		μa
Grid-No.2 Current	-15 to +15		μa
Field Strength of Adjustable Centering Magnet♦. .	0 to 12		gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*16000*	*volts*
and grid-No.2 to-grid-No.1 voltage of	*400*	*500*	*volts*
Grid-No.3 to-Grid-No.1 Voltage for focus	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster.	34 to 56	41 to 69	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	-34 to -56	-41 to -69	volts

Maximum Circuit Values:

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

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

✠ This value is a working design-center minimum. The equivalent *absolute minimum* ultor- or ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 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.

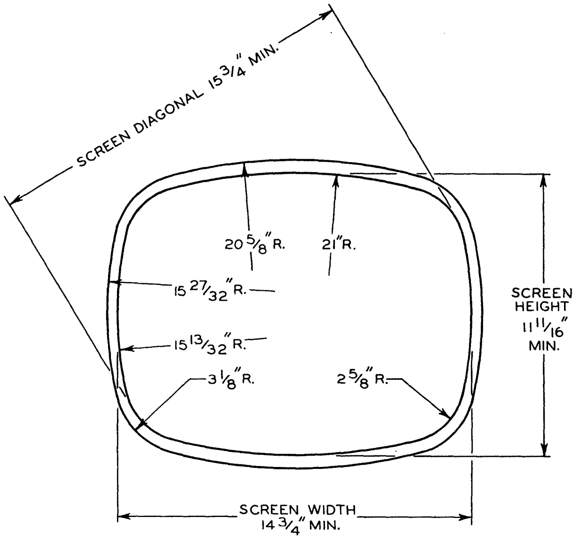
● Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 5/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

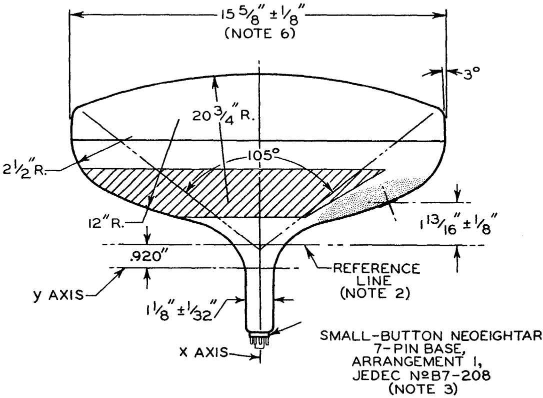
■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

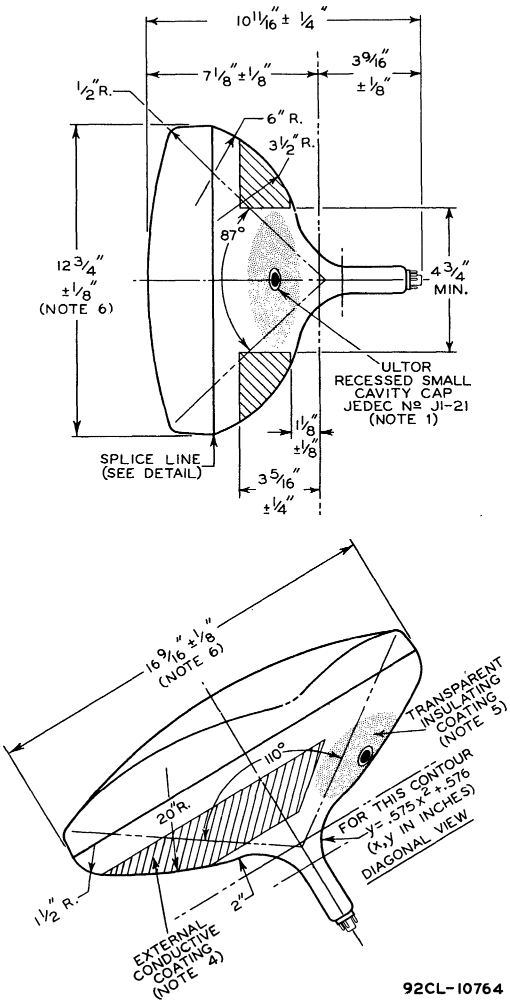
OPERATING CONSIDERATIONS

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.

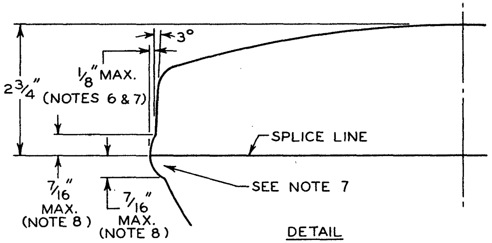
For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section


SCREEN DIAGONAL 15 3/4" MIN.
20 5/8" R.
21" R.
15 27/32" R.
15 13/32" R.
3 1/8" R.
2 5/8" R.
SCREEN HEIGHT 11 11/16" MIN.
SCREEN WIDTH 14 3/4" MIN.


15 5/8" ± 1/8"
(NOTE 6)
3°
20 3/4" R.
2 1/2" R.
105°
12" R.
1 13/16" ± 1/8"
.920"
REFERENCE LINE (NOTE 2)
y AXIS
1 1/8" ± 1/32"
X AXIS
SMALL-BUTTON NEOEIGHTAR 7-PIN BASE, ARRANGEMENT 1, JEDEC №B7-208 (NOTE 3)


10 11/16" ± 1/4"
7 1/8" ± 1/8"
3 9/16" ± 1/8"
1/2" R.
6" R.
3 1/2" R.
87°
12 3/4" ± 1/8" (NOTE 6)
4 3/4" MIN.
ULTOR
RECESSED SMALL CAVITY CAP
JEDEC № J1-21
(NOTE 1)
1 1/8" ± 1/8"
SPLICE LINE (SEE DETAIL)
3 5/16" ± 1/4"
16 9/16" ± 1/8" (NOTE 6)
TRANSPARENT INSULATING COATING (NOTE 5)
110°
20" R.
FOR THIS CONTOUR
y = .575 x² + .576
(x,y IN INCHES)
DIAGONAL VIEW
1 1/2" R.
2"
EXTERNAL CONDUCTIVE COATING (NOTE 4)

92CL-10764



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No. G-126 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: MEASURED 2-9/32" ± 1/32" FROM THE PLANE TANGENT TO THE SURFACE OF THE FACEPLATE AT THE TUBE AXIS.

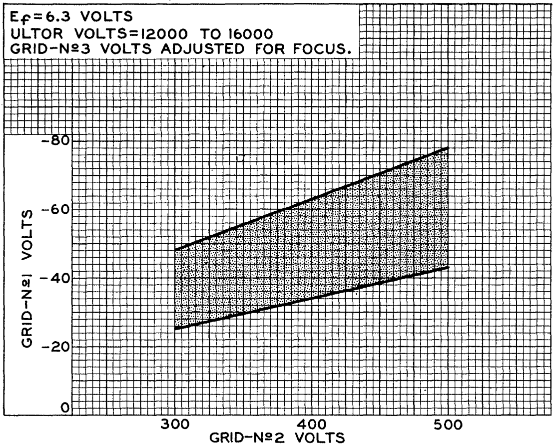
NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/4", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/8" BEYOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMENSIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.

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

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

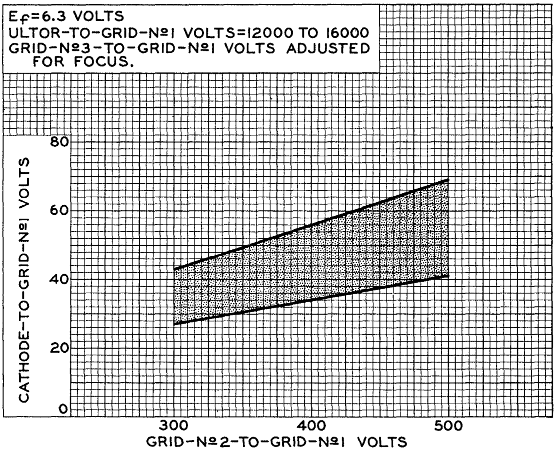
RASTER-CUTOFF-RANGE CHARTS

Grid-Drive Service



92CS-9930

Cathode-Drive Service



92CS-9931

17GP4

17GP4
PICTURE TUBE

RECTANGULAR METAL-SHELL TYPE

ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

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

Faceplate, Spherical . . . . Frosted Filterglass

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

Deflection Angles (Approx.):
- Diagonal . . . . 70°
- Horizontal . . . . 66°
- Vertical . . . . 50°

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

Tube Dimensions:
- Maximum overall length . . . . 19-5/16"
- Greatest width at lip. . . . . 15-15/16" ± 1/8"
- Greatest height at lip . . . . 12-1/4" ± 1/8"
- Diagonal at lip. . . . . 16-13/16" ± 3/16"
- Neck length. . . . . 7-1/2" ± 3/16"
- Radius of curvature of faceplate (External surface). . 30"

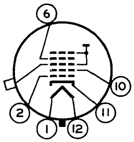
Screen Dimensions (Minimum):
- Greatest width . . . . 14-3/8"
- Greatest height. . . . . 10-11/16"
- Diagonal . . . . 15-1/4"

Operating Position . . . . Any

Ultor Terminal . . . . Metal-Shell Lip

Base . . Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-63)
- Basing Designation for BOTTOM VIEW 12M

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



Metal-Shell Lip - Ultor (Grid No.3, Grid No.5, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE	5000 max.	volts
GRID-No.2 VOLTAGE.	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value.	125 max.	volts
Positive-bias value.	0 max.	volts
Positive-peak value.	2 max.	volts

← Indicates a change.

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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 . . {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

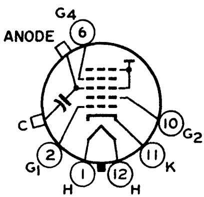
Optical:

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

Mechanical:

Weight (Approx.) . . . . 18 lbs
Overall Length . . . . 19-3/16" ± 3/8"
Neck Length. 7-1/2" ± 3/16"
Projected Area of Screen . . . . 149 sq. in.
External Conductive Coating:
  Type . . . . Regular-Band
  Contact area for grounding . . . . .Near Reference Line
For Additional Information on Coatings and Dimensions:
  See *Picture-Tube Dimensional-Outlines and Bulb J133 B/D* sheets at front of this section
Cap. . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-63)
  Basing Designation for BOTTOM VIEW 12L

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



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

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

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

ANODE VOLTAGE. . . . . 17500 max. volts
GRID-No.4 (FOCUSING) VOLTAGE:
  Positive value . . . . 1100 max. volts
  Negative value . . . . 550 max. volts

GRID-No.2 VOLTAGE.	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value.	220 max.	volts
Negative bias value.	155 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
HEATER VOLTAGE	6.9 max.	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 — 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 . .	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

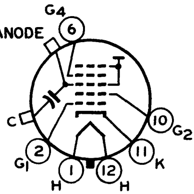
Optical:

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.B6-63)
Basing Designation for BOTTOM VIEW 12L

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



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

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

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

ANODE VOLTAGE.	17500 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts

GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
HEATER VOLTAGE	6.9 max.	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

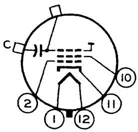
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
  Voltage . . . . 6.3 . . . . ac or dc volts
  Current . . . . 0.6 ± 10% . . . . .amp
Capacitance between External Conductive Coating and Ultor . . . . { 1500 max. $\mu\mu$f / 750 min. $\mu\mu$f }
Faceplate, Cylindrical . . . . .Filterglass
Phosphor (For curves, see front of this Section). . P4—Sulfide Type Aluminized
Deflection Angles (Approx.):
  Diagonal . . . . 70°
  Horizontal . . . . 65°
  Vertical . . . . 50°
Electron Gun . . . . .Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:
  Overall length . . . . 19-3/16" ± 3/8"
  Greatest width . . . . 15-25/64" ± 1/8"
  Greatest height. . . . . 12-9/32" ± 1/8"
  Diagonal . . . . 16-5/8" ± 1/8"
  Neck length. . . . . 7-1/2" ± 3/16"
  Radius of curvature of faceplate (External horizontal surface). . . . . 27"
Screen Dimensions (Minimum):
  Greatest width . . . . 14-1/4"
  Greatest height. . . . . 10-3/4"
  Diagonal . . . . 15-5/16"
  Projected area . . . . 140 sq. in.
Operating Position . . . . .Any
Cap. . . . . Recessed Small Cavity (JETEC No.J1-21)
Base . . Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57)
  Basing Designation for BOTTOM VIEW 12N

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



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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE. . . . . 18000 max. volts
GRID-No.2 VOLTAGE. . . . . 500 max. volts
GRID-No.1 VOLTAGE:
  Negative-bias value. . . . . 125 max. volts
  Positive-bias value. . . . . 0 max. volts
  Positive-peak value. . . . . 2 max. volts

← Indicates a change.

17QP4-A

PICTURE TUBE

PEAK HEATER–CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance	1.5 max.	megohms

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

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17TP4

PICTURE TUBE

RECTANGULAR METAL-SHELL TYPE

LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA

General:

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

Faceplate, Spherical . . . . .Frosted Filterglass

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

Deflection Angles (Approx.):
- Diagonal . . . . 70°
- Horizontal . . . . 66°
- Vertical . . . . 50°

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

Tube Dimensions:
- Maximum overall length . . . . 19-5/16"
- Greatest width at lip. . . . . 15-15/16" ± 1/8"
- Greatest height at lip . . . . 12-1/4" ± 1/8"
- Diagonal at lip. . . . . 16-13/16" ± 3/16"
- Neck length. . . . . 7-1/2" ± 3/16"
- Radius of curvature of faceplate (External surface). . 30"

Screen Dimensions (Minimum):
- Greatest width . . . . 14-3/8"
- Greatest height. . . . . 10-11/16"
- Diagonal . . . . 15-1/4"

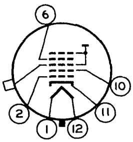
Operating Position . . . . .Any

Ultor Terminal . . . . .Metal-Shell Lip

Base . . Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-63)

Basing Designation for BOTTOM VIEW 12M

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



Metal-Shell Lip - Ultor (Grid No.3, Grid No.5, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

← Indicates a change.

RCA

17TP4

PICTURE TUBE

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

Maximum Circuit Values:

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

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

Picture Tube

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

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Direct Interelectrode Capacitances:

Cathode to all other electrodes	3.4	pf
Grid No.1 to all other electrodes	3.4	pf
External conductive coating to anode	1400 max.	pf
	850 min.	pf
Heater Current at 2.68 volts	450 ± 45	ma
Heater Warm-Up Time (Average)	11	seconds

Electron Gun . . . . Type Requiring No Ion-Trap Magnet

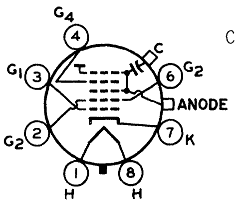
Optical:

Phosphor (For 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 — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **114° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts.	600 ± 5%	ma
Heater Warm-Up Time (Average).	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes. . .	6	μμf
Cathode to all other electrodes. . . .	5	μμf
External conductive coating to ultor .	1500 max.	μμf
	1000 min.	μμf

Electron Gun . . . . .Type Requiring No Ion-Trap Magnet

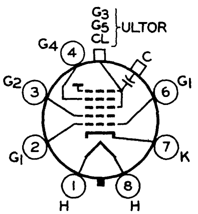
Optical:

Faceplate and Protective Panel . . . . .Filterglass
Light transmission (Approx.) 44%
Phosphor (For curves, see front of this Section) . P4—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 *Picture-Tube Dimensional-Outlines* and *Bulb J149 C* sheets at the front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . .Small-Button Neoeightar 7-Pin, Arrangement 1 (JEDEC No.B7-208)
Basing Designation for BOTTOM VIEW 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



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

Maximum Ratings, *Design-Maximum Values:*

ULTOR VOLTAGE	20000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor voltage of	*16000*	*volts*
and grid-No.2 voltage of	*300*	*volts*
Grid-No.4 Voltage for focus	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster	−35 to −72	volts

Maximum Circuit Values:

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

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

19AHP4

Picture Tube

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

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Direct Interelectrode Capacitances:

Cathode to all other electrodes	5	pf
Grid No.1 to all other electrodes . . .	6	pf
External conductive coating to anode. .	1500 max.	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

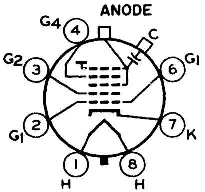
Optical:

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

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

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

ANODE VOLTAGE	17600 max. / 12000 min.	volts / volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	650 max.	volts
CATHODE VOLTAGE:		
Negative peak value	2 max.	volts
Negative bias value	0 max.	volts
Positive bias value	154 max.	volts
Positive peak value	220 max.	volts
HEATER VOLTAGE	6.9 max. / 5.7 min.	volts / volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode:		
Combined AC and DC voltage	200 max.	volts
DC component	100 max.	volts

Typical Operating Conditions for Cathode-Drive Service:

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

Anode Voltage	14000	volts
Grid-No.4 Voltage	0 to 400	volts
Grid-No.2 Voltage	500	volts
Cathode Voltage for visual extinction of focused raster	40 to 63	volts

Maximum Circuit Value:

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

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

19AJP4

Picture Tube

SHORT RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 114° MAGNETIC DEFLECTION
LOW GRID-No.2 VOLTAGE — CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	450 ± 10%	ma
Heater Warm-Up Time (Average)	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes . . .	6	$\mu\mu$f
Cathode to all other electrodes	5	$\mu\mu$f
External conductive coating to ultor. . .	1900 max.	$\mu\mu$f
	1400 min.	$\mu\mu$f

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

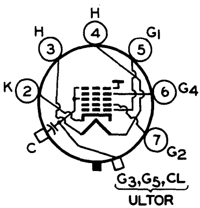
Optical:

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

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

ULTOR-TO-GRID-No.1 VOLTAGE	19800 max.	volts
	12000 min.	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.	volts
	40 min.	volts
CATHODE-TO-GRID-No.1 VOLTAGE	100 max.	volts
HEATER VOLTAGE	7 max.	volts
	5.8 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Typical Operating Conditions:

With ultor-to-grid-No.1 voltage of	*14500*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*50*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	0 to 500	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	31 to 49	volts

Maximum Circuit Values:

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

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

Picture Tube

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

With Heater Having Controlled Warm-Up Time

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

Electrical:

Heater Current at 6.3 volts.	450 ± 5%	ma

RCA

19AP4-B
PICTURE TUBE
ROUND METAL-SHELL TYPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

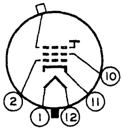
DATA

General:

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

Faceplate, Spherical . . . . Frosted Filterglass
Phosphor (For curves, see front of this Section) . P4—Sulfide Type
Deflection Angle (Approx.) . . . . 66°
Electron Gun . . . . Ion-Trap Type Requiring External Single-Field Magnet
Overall Length . . . . 21-1/2" ± 1/2"
Greatest Diameter of Bulb . . . . 18-5/8" ± 1/8"
Minimum Useful Screen Diameter . . . . 17-1/4"
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.

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

19AUP4

Picture Tube

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

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

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

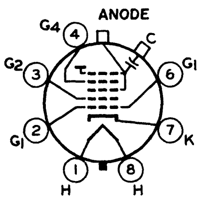
Optical:

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 — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		114°
Horizontal		102°
Vertical		85°
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	1500 max.	μμf
	1000 min.	μμf
Electron Gun		Type Requiring No Ion-Trap Magnet

Optical:

Faceplate	Filterglass
Light transmission at center (Approx.)	78%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Medium Short

Mechanical:

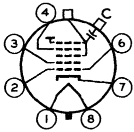
Tube Dimensions:	
Overall length	11-3/8" ± 1/4"
Greatest width	16-13/32" ± 1/8"
Greatest height	13-11/32" ± 1/8"
Diagonal	18-5/8" ± 1/8"
Neck length	4-1/8" ± 1/8"
Curvature of faceplate (External Radii):	
Center	48"
Edge	21"
Screen Dimensions (Minimum):	
Greatest width	15-1/8"
Greatest height	12"
Diagonal	17-9/16"
Projected area	172 sq. in.
Weight (Approx.)	14 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Bulb	J149A1

19AVP4

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

Basing Designation for BOTTOM VIEW. 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



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

GRID-DRIVE▲ SERVICE

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

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

ULTOR VOLTAGE	23000 max.	volts
	15000 min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value.	1100 max.	volts
Negative value.	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
	200 min.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	220 max.	volts
Negative-bias value	154 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
HEATER VOLTAGE.	6.9 max.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	450 max.	volts
After equipment warm-up period. . .	200 max.	volts
Heater positive with respect to cathode.	200 max.	volts

Typical Operating Conditions:

With ultor voltage (E_{c_5k}) of	*20000*	*volts*
and grid-No.2 voltage (E_{c_2k}) of	*400*	*volts*
Grid-No.4 Voltage for focus●.	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster★	-36 to -94	volts
Field Strength of Adjustable Centering Magnet♦	0 to 9	gausses

Maximum Circuit Values:

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

CATHODE-DRIVE▲ SERVICE

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

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

ULTOR-TO-GRID-No.1 VOLTAGE	23000 max. / 15000 min.	volts / volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	1250 max.	volts
Negative value	400 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	700 max. / 350 min.	volts / volts
GRID-No.2-TO-CATHODE VOLTAGE	550 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive-peak value	220 max.	volts
Positive-bias value	154 max.	volts
Negative-bias value	0 max.	volts
Negative-peak value	2 max.	volts
HEATER VOLTAGE	6.9 max. / 5.7 min.	volts / volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) *of*	*20000*	*volts*
and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) *of*	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus●	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster★	36 to 78	volts
Field Strength of Adjustable Centering Magnet♦	0 to 9	gausses

Maximum Circuit Values:

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

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

● The grid-No.4 (or grid-No.4-to-grid-No.1) voltage required for optimum focus of any individual tube will have a value anywhere between 0 and 400 volts, is independent of ultor current and will remain essentially constant for values of ultor (or ultor-to-grid-No.1) voltage or grid-No.2 (or grid-No.2-to-grid-No.1) voltage within design-maximum ratings shown for these items.

★ See *Raster-Cutoff-Range Chart for Grid-Drive Service.*

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

$$\sqrt{\frac{E_{c_5 k} \text{ or } E_{c_5 g_1} \text{ (volts)}}{16000 \text{ (volts)}}} \times 8 \text{ gausses}$$

The equipment manufacturer must determine and supply additional compensation for the effects of the earth's magnetic field and extraneous fields due to choice of circuitry and components. The additional compensation should preferably be applied as part of the magnetic field of the deflecting yoke.

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

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

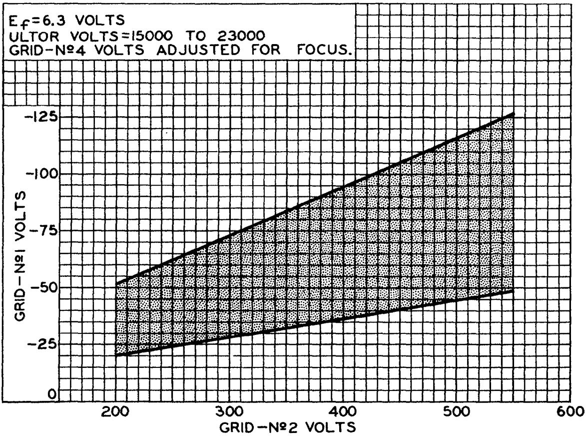
OPERATING CONSIDERATIONS

X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, this picture tube does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 23 kilovolts (Design-maximum value), shielding of this picture tube for X-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

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

RASTER-CUTOFF-RANGE CHARTS

Grid-Drive Service



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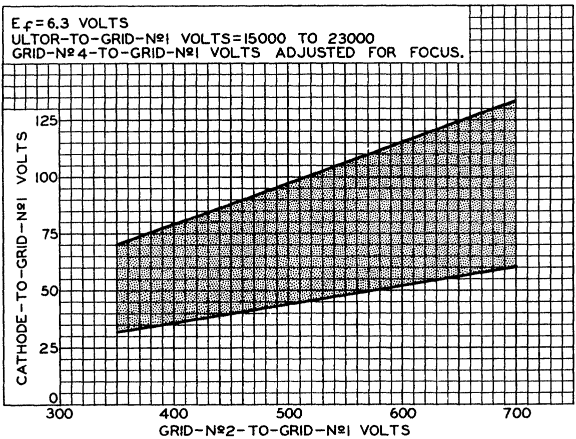
Cathode-Drive Service



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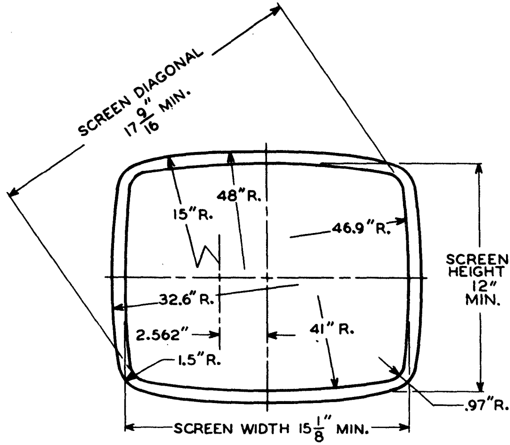
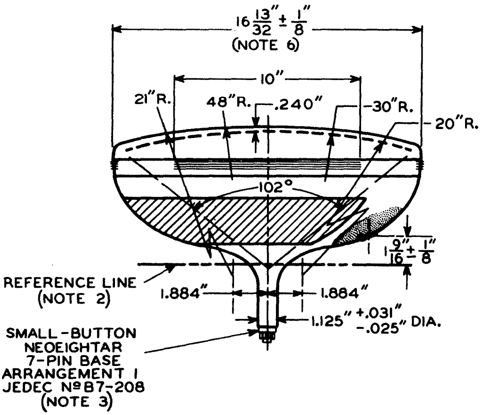
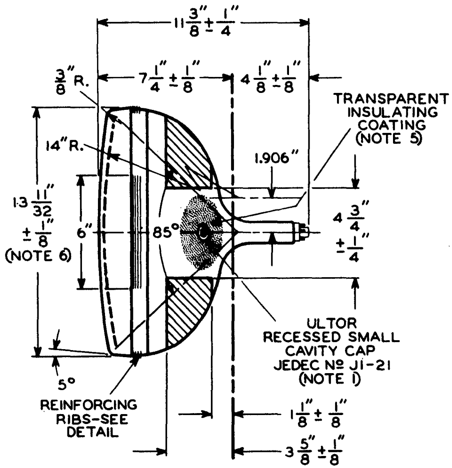
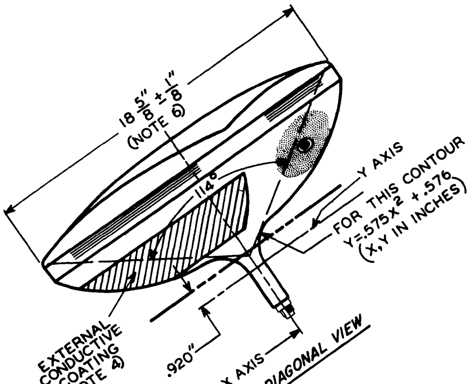
19AVP4


SCREEN DIAGONAL
17 9/16" MIN.
15"R.
48"R.
46.9"R.
SCREEN
HEIGHT
12"
MIN.
32.6"R.
2.562"
41"R.
1.5"R.
.97"R.
SCREEN WIDTH 15 1/8" MIN.


16 13/32" ± 1/8"
(NOTE 6)
10"
21"R.
48"R.
.240"
30"R.
20"R.
102°
1 9/16" ± 1/8"
REFERENCE LINE
(NOTE 2)
1.884"
1.884"
1.125" +.031" -.025" DIA.
SMALL-BUTTON
NEOEIGHTAR
7-PIN BASE
ARRANGEMENT 1
JEDEC Nº B7-208
(NOTE 3)





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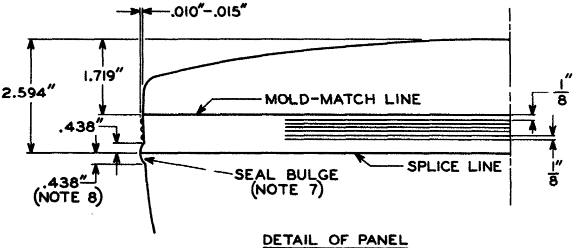


DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-126 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

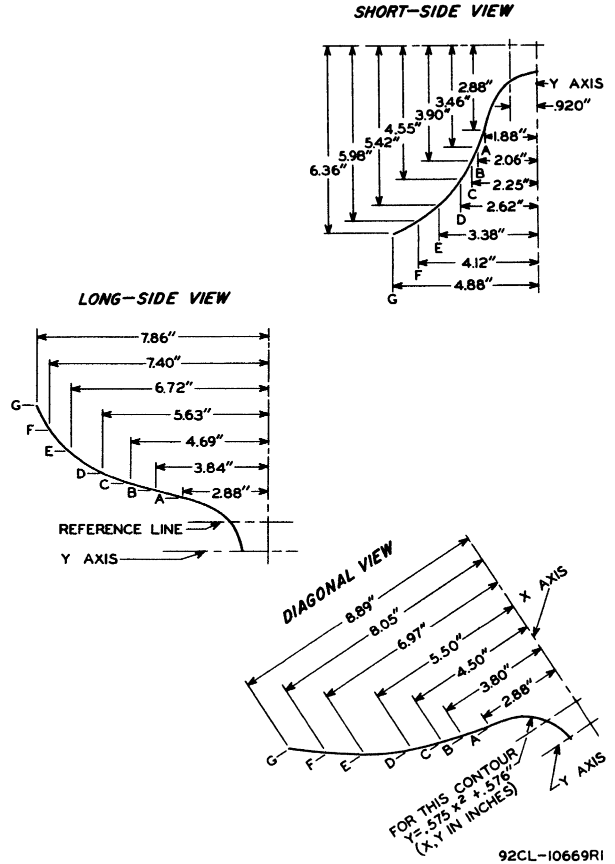
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: MEASURED AT THE MOLD-MATCH LINE.

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

NOTE 8: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/8" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF THE TUBE SUPPORT BAND. TUBE MOUNTING AND YOKE SUPPORT CLAMPS MUST BE SPECED 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.

19AYP4

Picture Tube

SHORT RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
114° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

The 19AYP4 is the same as the 19AVP4 except for the following item:

Electrical:

Heater Current at 6.3 volts. . . . . 450 ± 20 ma

19BDP4

Picture Tube

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

ALUMINIZED SCREEN
92° MAGNETIC DEFLECTION
CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 10%	ma
Heater Warm-Up Time (Average)	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes . . .	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor. . .	2000 max.	μμf
	1500 min.	μμf

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

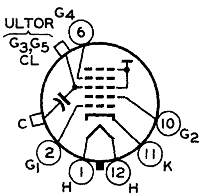
Optical:

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

Mechanical:

Operating Position. . . . . Any
Weight (Approx.). . . . . 15 lbs
Overall Length. . . . . 15-1/4" ± 3/8"
Neck Length . . . . 5-1/2" ± 3/16"
Projected Area of Screen. . . . . 172 sq. in.
External Conductive Coating:
Type. . . . . .Regular Band
Contact area for grounding. . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines* and *Bulb J149 B* sheets at the front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Bases (Alternates):
Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)
Small-Shell Duodecal 6-Pin, Arrangement 1 (JEDEC Group 4, No.B6-63)
Basing Designation for BOTTOM VIEW. 12L

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



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

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

ULTOR-TO-GRID-No.1 VOLTAGE	19800 max.	volts
	12000 min.	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.	volts
	40 min.	volts
CATHODE-TO-GRID-No.1 VOLTAGE	100 max.	volts
HEATER VOLTAGE	7 max.	volts
	5.8 min.	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

19BFP4

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **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

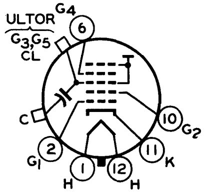
Optical:

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

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

Picture Tube

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

With Heater Having Controlled Warm-Up Time

The 19BTP4 is the same as the 19YP4 except for the following item:

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

ULTOR VOLTAGE	23000 max.	volts
	11000 min.	volts

19CHP4

Picture Tube

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

ALUMINIZED SCREEN
114° MAGNETIC DEFLECTION
CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes . . .	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor. . .	1500 max.	μμf
	1000 min.	μμf

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

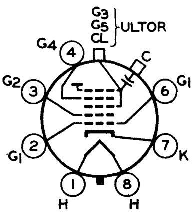
Optical:

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

Mechanical:

Operating Position. . . . . Any
Weight (Approx.). 14 lbs
Overall Length. . . . . 11-5/8" ± 1/4"
Neck Length . . . . 4-3/8" ± 1/8"
Projected Area of Screen. . . . . 172 sq. in.
External Conductive Coating:
Type. . . . . .Regular Band
Contact area for grounding. . . . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines* and *Bulb J149 A* sheets at the front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . .Small-Button Neoeightar 7-Pin, Arrangement 1 (JEDEC No.B7-208)
Basing Designation for BOTTOM VIEW. 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



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

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

ULTOR-TO-GRID-No.1 VOLTAGE	20000 max.	volts
	10000 min.	volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	1250 max.	volts
Negative value	400 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	70 max.	volts
	40 min.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive peak value	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.	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	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*50*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	-50 to +250	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	32 to 50	volts

Maximum Circuit Values:

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

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

Picture Tube

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 ± 30	ma
Heater Warm-Up Time (Average).	11	seconds

Electron Gun . . . . .Type Requiring No Ion-Trap Magnet

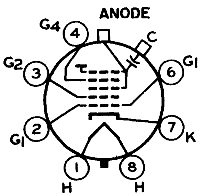
Optical:

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" ± 1/4"
Neck Length. 4-1/2" ± 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

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

19XP4

Picture Tube

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

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	$\mu\mu f$
Cathode to all other electrodes	5	$\mu\mu f$
External conductive coating to ultor	1500 max.	$\mu\mu f$
	1000 min.	$\mu\mu f$

Focusing Method . . . Electrostatic
Deflection Method . . . Magnetic
Deflection Angles (Approx.):
Diagonal . . . 114°
Horizontal . . . 102°
Vertical . . . 85°
Electron Gun . . . Type Requiring No Ion-Trap Magnet

Optical:

Faceplate . . . Filterglass
Light transmission at center (Approx.) . . . 78%
Phosphor (For Curves, see front of this Section) . P4—Sulfide Type Aluminized
Fluorescence . . . White
Phosphorescence . . . White
Persistence . . . Medium Short

Mechanical:

Tube Dimensions:
Overall length . . . 11-3/8" ± 1/4"
Greatest width . . . 16-13/32" ± 1/8"
Greatest height . . . 13-11/32" ± 1/8"
Diagonal . . . 18-5/8" ± 1/8"
Neck length . . . 4-1/8" ± 1/8"
Radius of curvature of faceplate:

	Radius at center	*Radius at edge*
External surface	48"	21"
Internal surface:		
In plane of diagonal deflection	30"	20"
In plane of horizontal deflection	30"	20"
In plane of vertical deflection	30"	14"

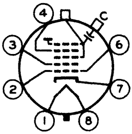
Screen Dimensions (Minimum):
Greatest width . . . 15-1/8"
Greatest height . . . 12"
Diagonal . . . 17-9/16"
Projected area . . . 172 sq. in.

19XP4

Weight (Approx.) . . . . 14 lbs
Operating Position. . . . . Any
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Bulb. J149A1
Base. . . . . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)

Basing Designation for BOTTOM VIEW. 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



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

GRID-DRIVE▲ SERVICE

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

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

ULTOR VOLTAGE	20000 max. / 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 ($E_{c_5}k$) between 11000 and 20000 volts and grid-No.2 voltage ($E_{c_2}k$) between 220 and 550 volts

Grid-No.4 Voltage for focus●.	0 to 400	volts
Grid-No.1 Voltage ($E_{c_1}k$) for visual extinction of focused raster.	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	

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

Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*volts*
and grid-No.2 voltage of	*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

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) between 11000 and 20000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) 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_{kg_1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet★	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*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.

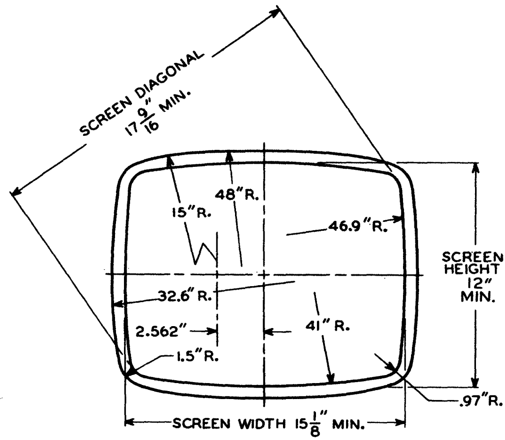
★ Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 5/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic 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.

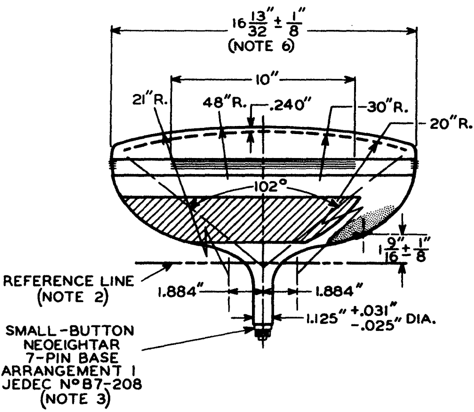
OPERATING CONSIDERATIONS

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.

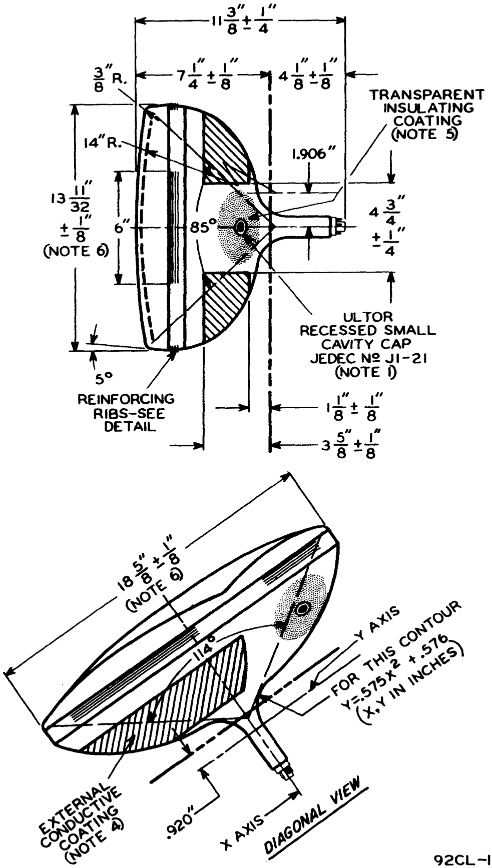
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of this picture tube to protect it from being struck accidentally and to protect against possible damage resulting from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



SCREEN DIAGONAL
17 9/16" MIN.
48"R.
15"R.
46.9"R.
SCREEN HEIGHT
12"
MIN.
32.6"R.
2.562"
41"R.
1.5"R.
.97"R.
SCREEN WIDTH 15 1/8" MIN.



16 13/32" ± 1/8"
(NOTE 6)
10"
21"R.
48"R.
.240"
30"R.
20"R.
102°
1 9/16" ± 1/8"
REFERENCE LINE
(NOTE 2)
1.884"
1.884"
1.125" +.031" -.025" DIA.
SMALL-BUTTON
NEOEIGHTAR
7-PIN BASE
ARRANGEMENT 1
JEDEC Nº B7-208
(NOTE 3)



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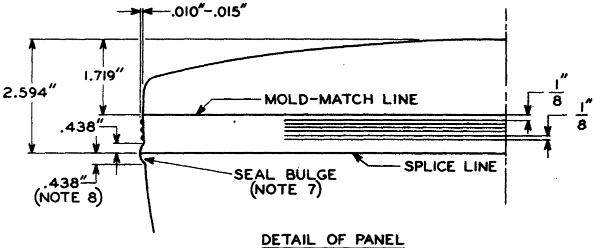


DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-126 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

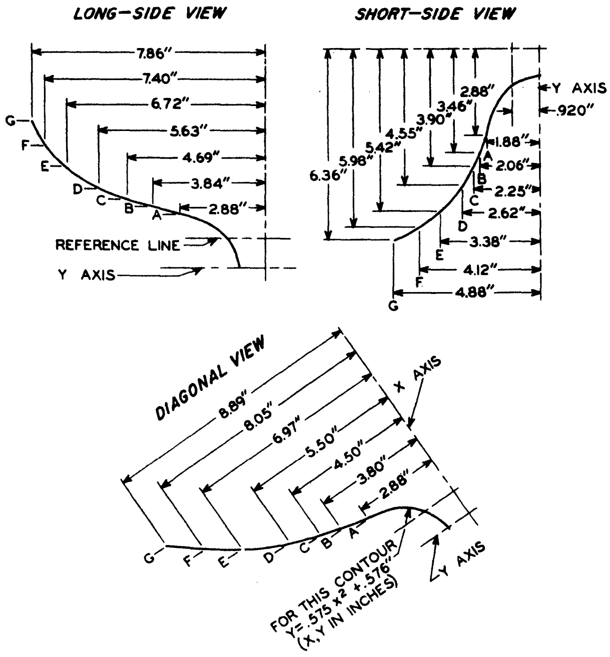
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: MEASURED AT THE MOLD-MATCH LINE.

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

NOTE 8: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/8" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF THE TUBE SUPPORT BAND. TUBE MOUNTING AND YOKE SUPPORT CLAMPS MUST BE SPACED FROM THE TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

BULB-CONTOUR DIMENSIONS

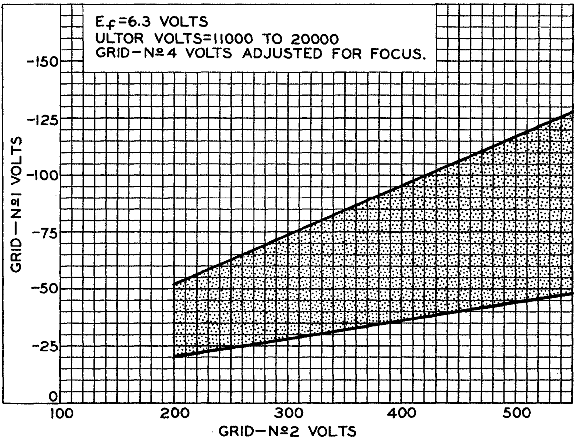


92CL-10669R1

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.

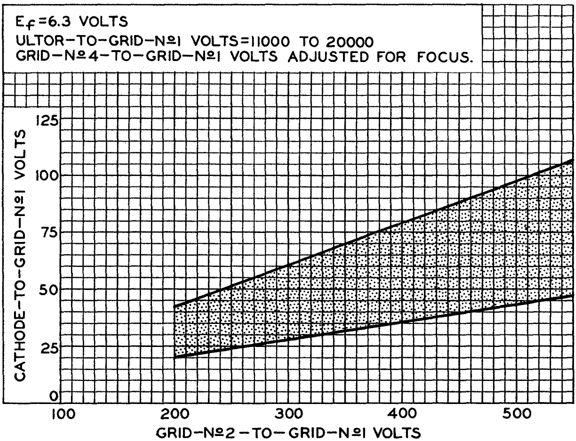
RASTER-CUTOFF-RANGE CHARTS

Grid-Drive Service



92CS-10640

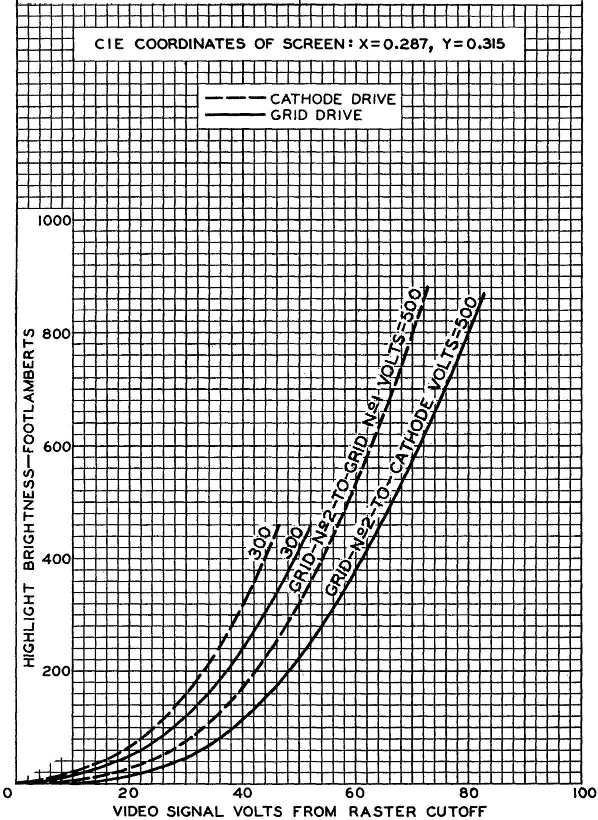
Cathode-Drive Service



92CS-10641

AVERAGE DRIVE CHARACTERISTICS

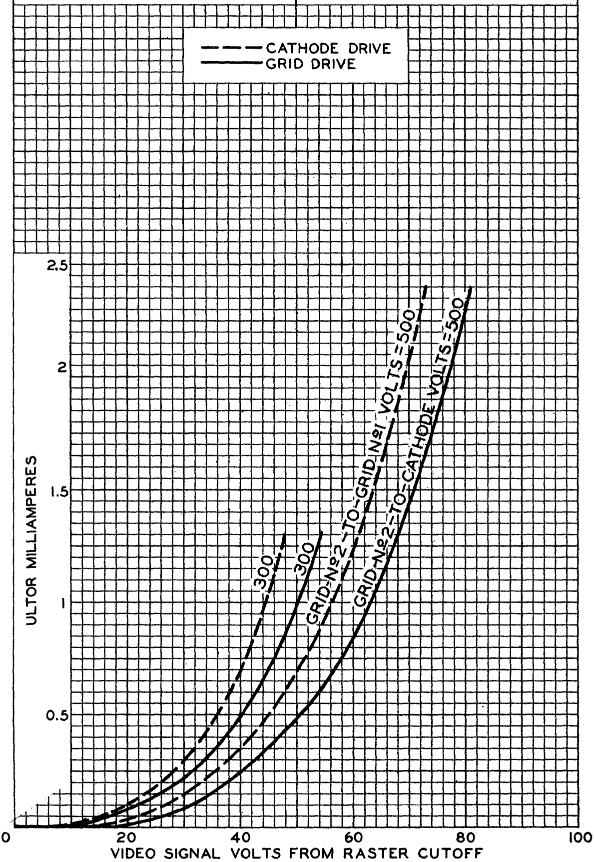
CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-Nº1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID Nº1 TO GIVE FOCUSED RASTER CUTOFF.	GRID Nº1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 14" x 10½"	RASTER SIZE = 14" x 10½"



92CM—10647R1

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS = 11000 TO 20000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 6.3 VOLTS ULTOR VOLTS = 11000 TO 20000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



92CM-10643

Picture Tube

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

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		114°
Horizontal		102°
Vertical		85°
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	1500 max.	μμf
	1000 min.	μμf
Electron Gun		Type Requiring No Ion-Trap Magnet

Optical:

Faceplate	Filterglass
Light transmission at center (Approx.)	78%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Medium Short

Mechanical:

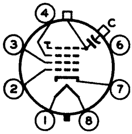
Tube Dimensions:	
Overall length	10-13/16" ± 1/4"
Greatest width	16-13/32" ± 1/8"
Greatest height	13-11/32" ± 1/8"
Diagonal	18-5/8" ± 1/8"
Neck length	3-9/16" ± 1/8"
Curvature of faceplate (External Radii):	
Center	48"
Edge	21"
Screen Dimensions (Minimum):	
Greatest width	15-1/8"
Greatest height	12"
Diagonal	17-9/16"
Projected area	172 sq. in.
Weight (Approx.)	14 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Bulb	J149A1

19YP4

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

Basing Designation for BOTTOM VIEW. 8JR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.3
Pin 6 - Internal Connection— Do Not Use
Pin 7 - Cathode



Pin 8 - Heater
Cap - Ultor (Grid No.4, Collector)
C - External Conductive Coating

GRID-DRIVE▲ SERVICE

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

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

ULTOR VOLTAGE	20000 max.	volts
	11000 min.	volts
GRID-No.3 (FOCUSING) VOLTAGE:		
Positive value.	700 max.	volts
Negative value.	350 max.	volts
GRID-No.2 VOLTAGE	600 max.	volts
	300 min.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value	220 max.	volts
Negative-bias value	154 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
HEATER VOLTAGE.	6.9 max.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	450 max.	volts
After equipment warm-up period. . .	200 max.	volts
Heater positive with respect to cathode.	200 max.	volts

Typical Operating Conditions:

With ultor voltage (E_{c_4k}) *of*	*16000*	*volts*
and grid-No.2 voltage (E_{c_2k}) *of*	*500*	*volts*
Grid-No.3 Voltage for focus•.	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster★	-43 to -78	volts
Field Strength of Adjustable Centering Magnet♦	0 to 10	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
GRID-No.2-TO-CATHODE VOLTAGE	600 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive-peak value	220 max.	volts
Positive-bias value	154 max.	volts
Negative-bias value	0 max.	volts
Negative-peak value	2 max.	volts
HEATER VOLTAGE	6.9 max.	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 ($E_{c_4g_1}$) *of*	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) *of*	*500*	*volts*
Grid-No.3-to-Grid-No.1 Voltage for focus●	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster♠	41 to 69	volts
Field Strength of Adjustable Centering Magnet♦	0 to 10	gausses

Maximum Circuit Values:

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

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

● The grid-No.3 voltage required for optimum focus of any individual tube may have a value anywhere between 0 and 400 volts and is a function of the value of the ultor voltage, ultor current, and grid-No.2 voltage. It changes directly with the ultor voltage at the rate of approximately 46 volts for each 1000-volt change in ultor voltage; inversely with grid-No.2 voltage at the rate of about 60 volts for each 100-volt change in grid No.2 voltage; and inversely with ultor current at the rate of about 60 volts for each 100-microampere change in ultor current. Because this tube has a narrow depth of focus, it is necessary to provide means such as a potentiometer or a 4-tap switch for adjusting the focusing voltage. In general, commercially acceptable focus is obtained if the focusing voltage is within 75 volts of the value required for optimum focus and if the focusing voltage is maintained to within 75 volts of the optimum value during line-voltage fluctuations.

★ See *Raster-Cutoff-Range Chart for Grid-Drive Service*.

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

$$\sqrt{\frac{E_{c_4k} \text{ or } E_{c_4g_1} \text{ (volts)}}{16000 \text{ (volts)}}} \times 10 \text{ gausses}$$

The equipment manufacturer must determine and supply additional compensation for the effects of the earth's magnetic field and extraneous fields due to choice of circuitry and components. The additional compensation should preferably be applied as part of the magnetic field of the deflecting yoke.

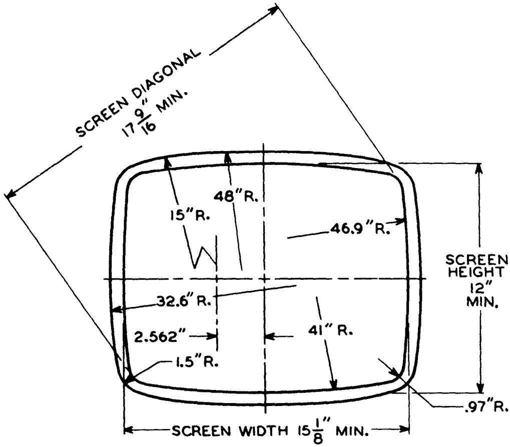
♣ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

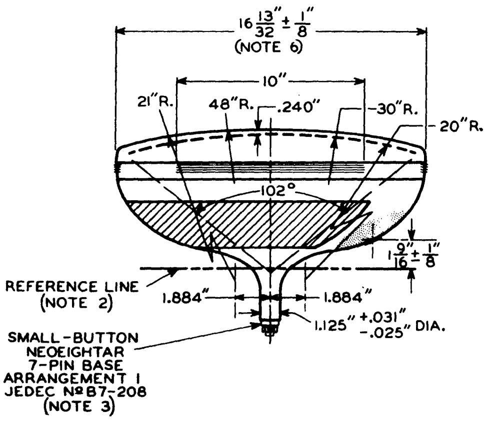
♠ See *Raster-Cutoff-Range Chart for Cathode-Drive Service*.

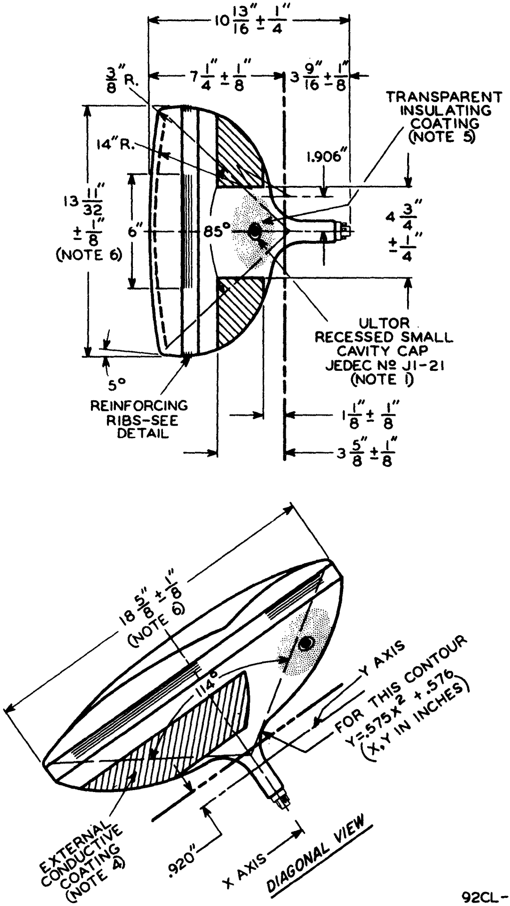
OPERATING CONSIDERATIONS

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

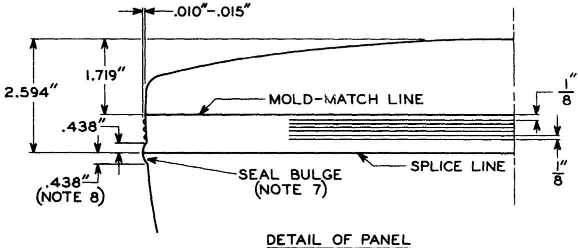

SCREEN DIAGONAL
17 9/16" MIN.
48"R.
15"R.
46.9"R.
SCREEN HEIGHT
12"
MIN.
32.6"R.
2.562"
41"R.
1.5"R.
.97"R.
SCREEN WIDTH 15 1/8" MIN.


16 13/32" ± 1/8"
(NOTE 6)
10"
21"R.
48"R.
.240"
30"R.
20"R.
102°
1 9/16" ± 1/8"
REFERENCE LINE
(NOTE 2)
1.884"
1.884"
1.125" +.031" -.025" DIA.
SMALL-BUTTON
NEOEIGHTAR
7-PIN BASE
ARRANGEMENT 1
JEDEC Nº B7-208
(NOTE 3)



10 13/16" ± 1/4"
3/8" R.
7 1/4" ± 1/8"
3 9/16" ± 1/8"
TRANSPARENT INSULATING COATING (NOTE 5)
14" R.
1.906"
13 11/32" ± 1/8" (NOTE 6)
6"
85°
4 3/4" ± 1/4"
ULTOR RECESSED SMALL CAVITY CAP JEDEC № J1-21 (NOTE 1)
5°
REINFORCING RIBS-SEE DETAIL
1 1/8" ± 1/8"
3 5/8" ± 1/8"
18 5/8" ± 1/8" (NOTE 6)
114°
Y AXIS
FOR THIS CONTOUR Y=.575X² + .576 (X,Y IN INCHES)
EXTERNAL CONDUCTIVE COATING (NOTE 4)
.920"
X AXIS
DIAGONAL VIEW

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 ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-126 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

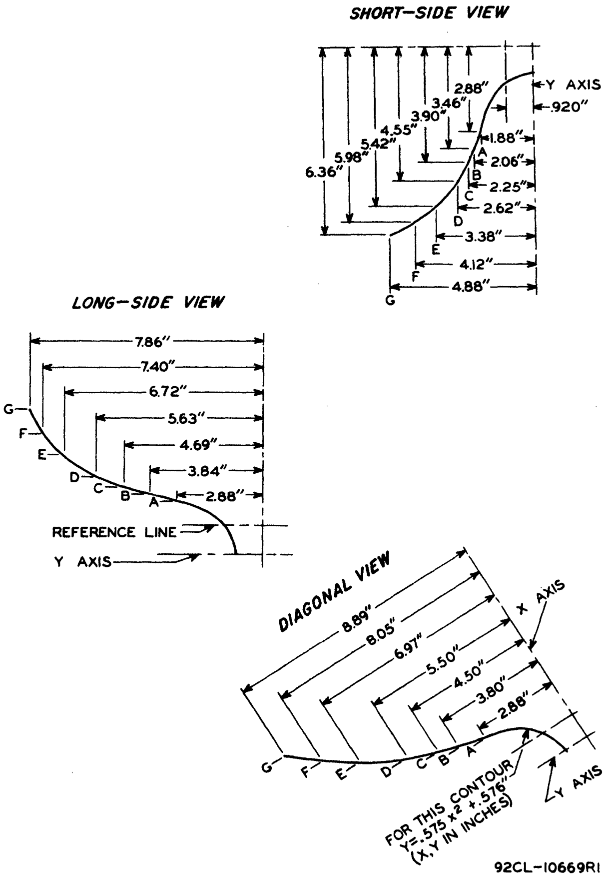
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: MEASURED AT THE MOLD-MATCH LINE.

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

NOTE 8: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/8" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF THE TUBE SUPPORT BAND. TUBE MOUNTING AND YOKE SUPPORT CLAMPS MUST BE SPACED FROM THE TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

BULB-CONTOUR DIMENSIONS



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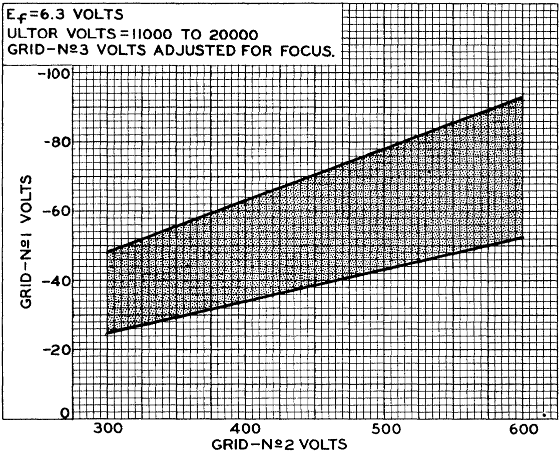
NOTE: PLANES A THROUGH G ARE NORMAL TO THE TUBE AXIS AND AT FIXED LOCATIONS FROM THE Y AXIS. THESE COORDINATES DESCRIBE THE BOGIE-BULB EXTERNAL CONTOUR IN PLANES THROUGH THE TUBE AXIS AND THE RESPECTIVE FACEPLATE AXES.

RASTER-CUTOFF-RANGE CHARTS

Grid-Drive Service



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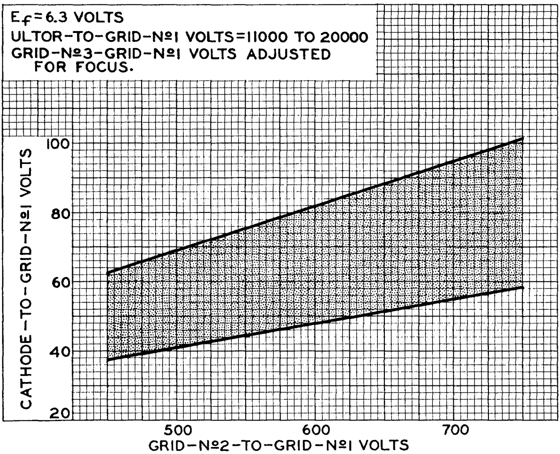
Cathode-Drive Service



92CS-10818

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.	pf
	500 min.	pf
Heater Current at 6.3 volts	600 ± 30	ma

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

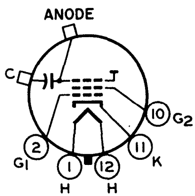
Optical:

Phosphor (For curves, see front of this Section). P4—Sulfide Type, Aluminized
Faceplate, Spherical. . . . . Filterglass
Light transmission (Approx.). 75%

Mechanical:

Weight (Approx.). . . . . 30 lbs
Overall Length. . . . . 21-3/4" ± 3/8"
Neck Length . . . . 7-1/2" ± 3/16"
Projected Area of Screen. . . . . 215 sq.in.
External Conductive Coating:
Type. . . . . .Regular-Band
Contact area for grounding. . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J161 C/D* sheets at front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . .Small-Shell Duodecal 5-Pin (JEDEC Group 4, No.B5-57)
Basing Designation for BOTTOM VIEW. 12N

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



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

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

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

ANODE VOLTAGE	20000 max.	volts
GRID-No.2 VOLTAGE	450 max.	volts

GRID-No.1 VOLTAGE:		
Negative bias value	140 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
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 — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 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

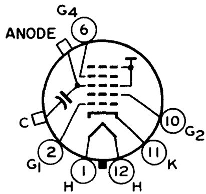
Optical:

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

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



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

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

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

ANODE VOLTAGE	17500 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value.	1100 max.	volts
Negative value.	550 max.	volts

GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative 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:

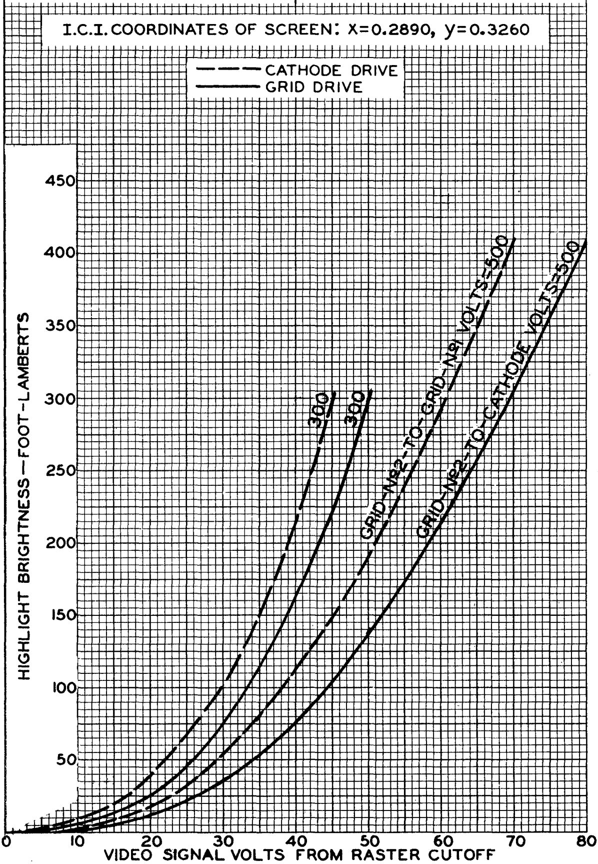
Grid-No.1-Circuit Resistance.	1.5 max.	megohms

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

21ACP4-A/21BSP4/21AMP4-A

AVERAGE DRIVE CHARACTERISTICS

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



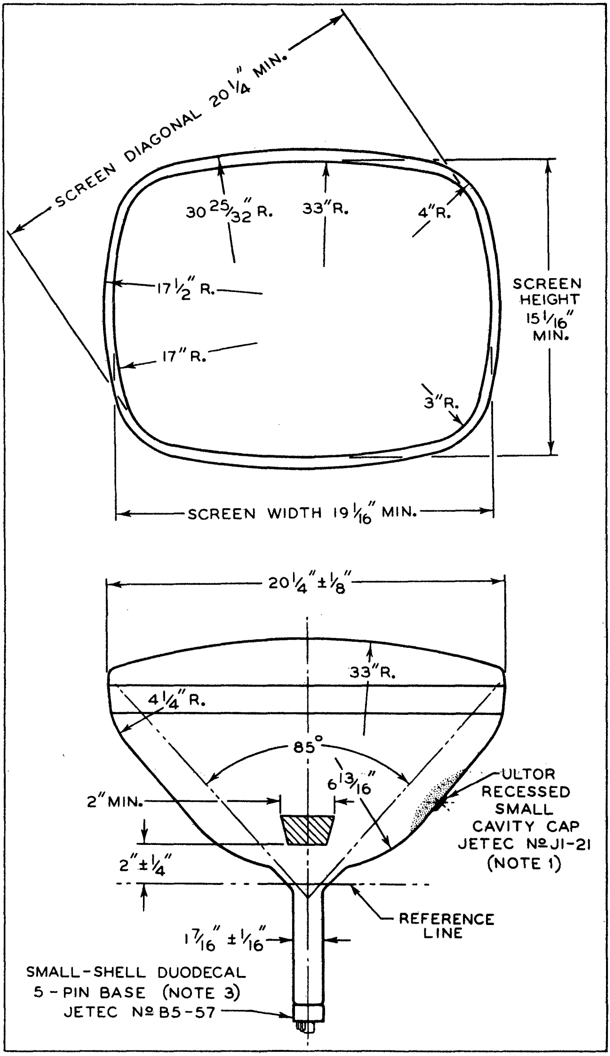
ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8771R1

21ACP4-A/21BSP4/21AMP4-A

PICTURE TUBE



21AMP4A

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
MAGNETIC FOCUS — **90° MAGNETIC DEFLECTION**

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600	ma
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	$\mu\mu f$
Cathode to all other electrodes	5	$\mu\mu f$
External conductive coating to ultor. . . .	2500 max.	$\mu\mu f$
	2000 min.	$\mu\mu f$

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

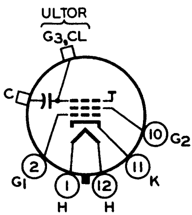
Optical:

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" ± 3/8"
Neck Length . . . . 7-1/2" ± 3/16"
Projected Area of Screen. . . . . 262 sq. in.
External Conductive Coating:
Type. . . . . .Regular-Band
Contact area for grounding. . . . . Near Reference Line
For Additional Information on Coatings 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

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

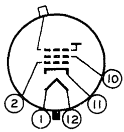
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Faceplate, Spherical		Frosted Filterglass
Phosphor (For Curves, see front of this Section)		P4—Sulfide Type
Deflection Angles (Approx.):		
Diagonal		70°
Horizontal		66°
Vertical		50°
Electron Gun		Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:		
Maximum overall length		22-5/8"
Greatest width at lip		19-23/32" ± 1/8"
Greatest height at lip		15-5/16" ± 1/8"
Diagonal at lip		20-3/4" ± 1/4"
Neck length		7-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)		33"
Screen Dimensions (Minimum):		
Greatest width		18-1/8"
Greatest height		13-11/16"
Diagonal		19-1/8"
Operating Position		Any
Ultor Terminal		Metal-Shell Lip
Base		Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57)
Basing Designation for BOTTOM VIEW		12D

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



Metal-Shell Lip - Ultor (Grid No.3, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

← Indicates a change.

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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 — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 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 $\mu\mu$f
  Cathode to all other electrodes . . . . . . 5 $\mu\mu$f
  External conductive coating to ultor. . . . $\begin{cases} 2500 \text{ max.} & \mu\mu f \\ 2000 \text{ min.} & \mu\mu f \end{cases}$
Electron Gun. . . . . .Ion-Trap Type Requiring External Single-Field Magnet

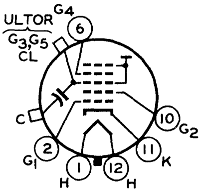
Optical:

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" ± 3/8"
Neck Length . . . . 7-1/2" ± 3/16"
Projected Area of Screen. . . . . 262 sq. in.
External Conductive Coating:
  Type. . . . . Special
  Contact area for grounding. . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
  See *Picture-Tube Dimensional-Outlines* and *Bulb J171 B/F* sheets at the front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . Small-Shell Duodecal 6-Pin, Arrangement 1, (JEDEC Group 4, No.B6-63)
  Basing Designation for BOTTOM VIEW. 12L

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



Cap - 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

RCA

21AWP4

PICTURE TUBE

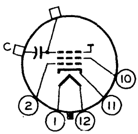
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
  Voltage . . . . 6.3 . . . . ac or dc volts
  Current . . . . 0.6 ± 10% . . . . amp
Capacitance between External Conductive Coating and Ultor . . . . {2500 max. $\mu\mu$f / 2000 min. $\mu\mu$f}
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.

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

Faceplate, Spherical . . . . Filterglass
  Light transmission (Approx.) 77%

Screen, on Inner Surface of Faceplate:
  Type . . . . Aluminized, Tricolor, Phosphor-Dot
  Phosphor (Three separate phosphors, collectively) P22
    Fluorescence and phosphorescence of separate phosphors, respectively . . . Blue, Green, Red
    Persistence of group phosphorescence . . . . Medium
  Dot arrangement . . . . Triangular group consisting of blue dot, green dot, and red dot
  Spacing between centers of adjacent dot trios (Approx.) 0.029"
  Size (Minimum):
    Greatest width . . . . 19-1/16"
    Height . . . . 15-1/4"
    Projected area . . . . 255 sq. in.

Focusing Method . . . . Electrostatic
Convergence Method . . . . Magnetic
Deflection Method . . . . Magnetic

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

Tube Dimensions:
  Maximum overall length . . . . 25-5/16"
  Diameter:
    At lip . . . . 20-9/16" ± 1/8"
    At flange . . . . 20-15/16" ± 5/16"

Weight (Approx.) . . . . 28 lbs

Mounting Position . . . . Tube axis horizontal (base pin 12 on top)

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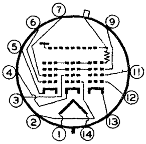
Ultor Terminal. Metal Shell
Base. . . . Small-Shell Neodiheptal 12-Pin (JETEC No.B12-131)
Socket. . . . . Alden Nos.214NMINSC (Radial leads), 214NMINC (Axial leads), or equivalent
Basing Designation for BOTTOM VIEW. 14AH

Pin 1 - Heater
Pin 2 - Grid No.1 of Red Gun
Pin 3 - Grid No.2 of Red Gun
Pin 4 - Cathode of Red Gun
Pin 5 - Cathode of Green Gun
Pin 6 - Grid No.1 of Green Gun
Pin 7 - Grid No.2 of Green Gun



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

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-CATHODE (Of each gun) VOLTAGE. . .	25000 max.	volts
ULTOR CURRENT, (Average, each gun).	500* max.	μamp
GRID-No.3-TO-CATHODE (Of each gun) VOLTAGE .	6000 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE (Each gun) . .	800 max.	volts
GRID-No.1-TO-CATHODE VOLTAGE (Each gun):		
Negative bias value	400 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE (Each gun):		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	410 max.	volts
After equipment warm-up period.	180 max.	volts
Heater positive with respect to cathode .	180 max.	volts

Equipment Design Ranges:

With any ultor voltage ($Ec_4k_{each\ gun}$) between 20000# and 25000 volts

Grid-No.3 (Focusing electrode)-to-Cathode (Of each gun) Voltage .	15.2% to 21.2% of $Ec_4k_{each\ gun}$	volts
Grid-No.2-to-Cathode Voltage (Each gun) when circuit design utilizes grid-No.1-to-cathode voltage (Ec_1k) at fixed value for raster cutoff.	*See Cutoff Design Chart*	

*,#: see next page.

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COLOR KINESCOPE

Grid-No.1-to-Cathode Voltage (Each gun) for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2-to-cathode voltage (E_{c_2k}) at fixed value.	*See Cutoff Design Chart*	
Variation in Raster Cutoff Between Guns in Any Tube.	± 21% of average of highest and lowest cutoff values	
Grid-No.3 Current for ultor current of 800 μamp.	-45 to +75	μamp
Grid-No.2 Current (Each gun) . . .	-5 to +5	μamp
Percentage of Total Ultor Current Supplied by Each Gun:		
To produce Illuminant-C White (I.C.I. Coordinates x = 0.310, y = 0.316):		
Red gun.	47 to 67	per cent
Blue gun	11 to 24	per cent
Green gun.	20 to 33	per cent
To produce White of 8500°K + 27 M.P.C.D. (I.C.I. Coordinates x = 0.287, y = 0.316):		
Red gun.	42 to 60	per cent
Blue gun	12 to 27	per cent
Green gun.	23 to 38	per cent
Maximum Raster Shift in Any Direction from Screen Center□. .	1	inch
Adjustment to be Provided by the Following Components:		
Purifying magnet	Raster shift of 1" max. in any direction from screen center	
Magnetic-field equalizer	Beam displacement with respect to phosphor dot at position of max. displacement (i.e., edge of screen)	
Tangential	±0.0005" to ±0.007"	
Radial	±0.0005" to ±0.005"	

* A value of average ultor current per gun higher than 500 microamperes will increase picture brightness but may impair resolution and shorten cathode life.

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

Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 20000 volts.

21AXP22-A

COLOR KINESCOPE

Lateral-Converging Magnet:⊕ ♠	
After adjustment has been made for color purity and dynamic convergence—	
Max. shift of blue beam	±1/4"
Max. shift of red and green beams	±1/8" to ±3/8"
Average of max. shift of red and green beams	±7/32" to ±9/32"
Radial-Converging Magnet Assembly:⊕	
For static convergence—	
After adjustment has been made for optimum color purity and dynamic convergence (Each beam)	Shift of ±5/8"
For dynamic convergence†—	
Effected by magnetomotive force of parabolic and/or sawtooth waveshape synchronized with scanning.	
Horizontal:	
Blue pattern—	
Parabola amplitude to provide▲	Shift of 1/4" to 9/16"
Sawtooth amplitude to provide∞	Shift of ±50% of the shift caused by parabola amplitude
Red pattern & green pattern—	
Parabola:	
Amplitude to provide▲	Shift of 1/8" to 3/8"
Ratio of red-pattern shift to green-pattern shift	1/2 to 2
Sawtooth:	
Amplitude for red pattern to provide∞	Shift of -35% to +85% of the shift caused by parabola amplitude
Amplitude for green pattern to provide∞	Shift of -85% to +35% of the shift caused by parabola amplitude
Difference between red-pattern shift and green-pattern shift ($Shift_R - Shift_G$)	0 to +100%
Vertical:	
Blue pattern—	
Parabola amplitude to provide▲	Shift of 0 to 1/8"

⊕,♠,†,▲,∞: see next page.

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COLOR KINESCOPE

For dynamic convergence† (Cont'd):

Vertical:

Sawtooth amplitude to provide°° . . . . Shift of 0 to 1/4"

Red pattern & green pattern—

Parabola:

Amplitude to provide▲. . . . Shift of 1/8" to 3/8"

Ratio of red-pattern shift to green-pattern shift . . . . 1/2 to 2

Sawtooth:

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

Difference between red-pattern shift and green-pattern shift ($Shift_R$ - $Shift_G$) . . . . 0 to +100%

Examples of Use of Design Ranges:

For ultor voltage of	*20000*	*25000*	*volts*
Grid-No.3 (Focusing Electrode)-to-Cathode (Of Each Gun) Voltage.	3040 to 4240	3800 to 5300	volts
Grid-No.2-to-Cathode Voltage (Each Gun) when circuit design utilizes grid-No.1-to-cathode voltage of -70 volts for raster cutoff.	130 to 370	130 to 370	volts
Grid-No.1-to-Cathode Voltage (Each Gun) for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2-to-cathode voltage of 200 volts	-45 to -100	-45 to -100	volts

Limiting Circuit Values:

High-Voltage Circuits:

In order to minimize the possibility of damage to the tube caused by a momentary internal arc, it is recommended that the *ultor power supply* and the *grid-No.3 power supply* be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 50 milliamperes. In addition, to prevent cathode damage with resultant decrease in tube life, the effective resistance between grid-No.3 power supply output capacitor and the grid-No.3 electrode should be not less than 50000 ohms. This resistance should be capable of withstanding the maximum instantaneous current and voltage in the grid-No.3 circuit.

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

⊕,●,†,▲,°°: See next page.

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21AXP22-A
COLOR KINESCOPE

Low-Voltage Circuits:
Grid-No.1-Circuit Resistance (Each Gun) . . . . 1.5 max. megohms

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

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

⊕ Shift is the movement of the regions of bar-or-dot-generator pattern indicated in notes (▲) and (oo).

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

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

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

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

X-RAY WARNING

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

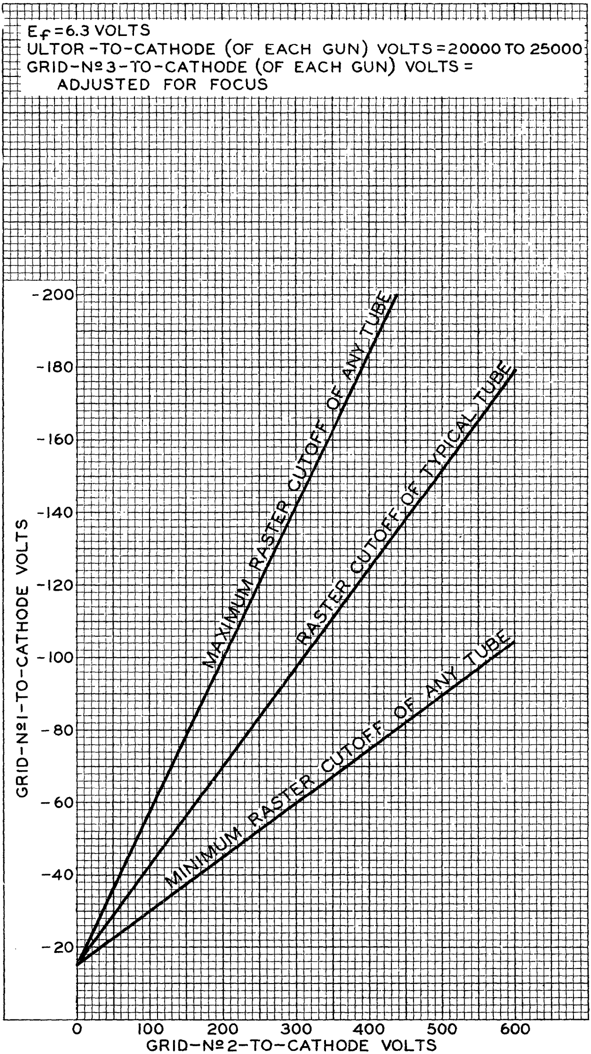
When this tube is being serviced outside of the TV receiver cabinet, it should never be operated without providing adequate X-ray shielding in front of faceplate. Because the ultor voltage may rise above its maximum rated value for short periods during adjustment with increase in the amount of X-ray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

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

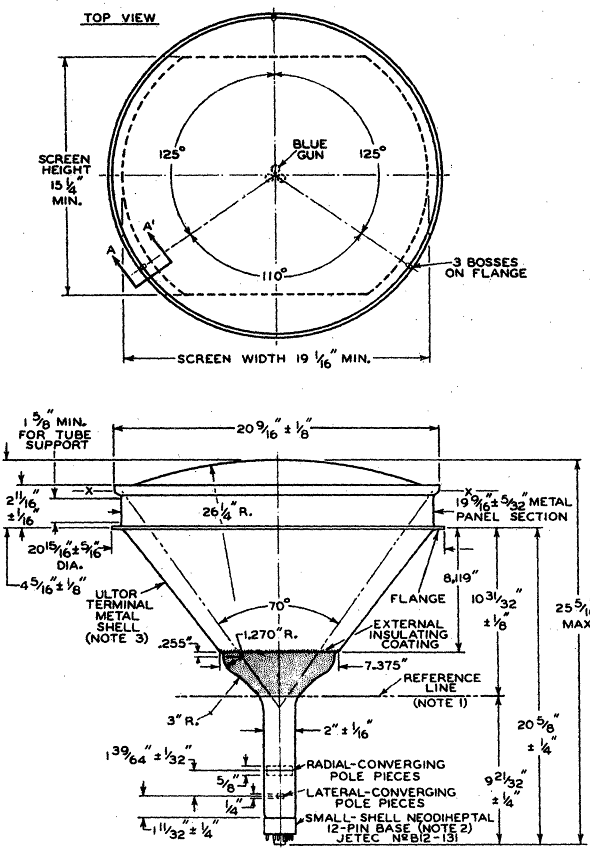
21AXP22-A

CUTOFF DESIGN CHART



21AXP22-A

21AXP22-A
COLOR KINESCOPE



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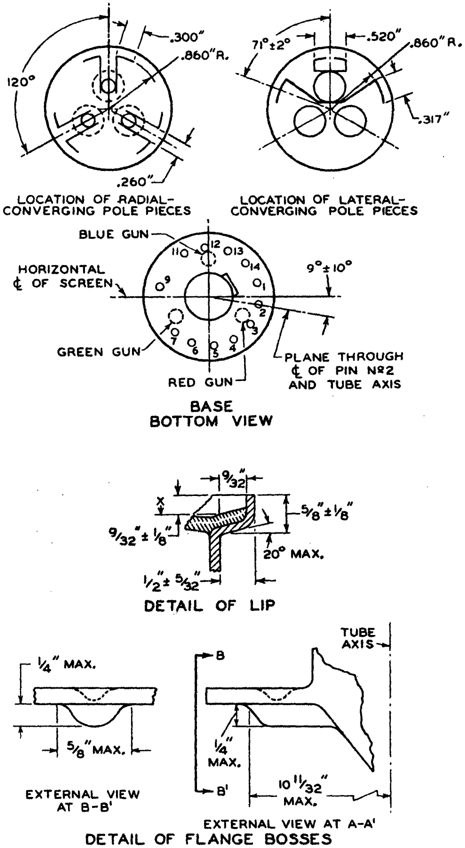
21AXP22-A
COLOR KINESCOPE



92CL-8399R4

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21AXP22-A

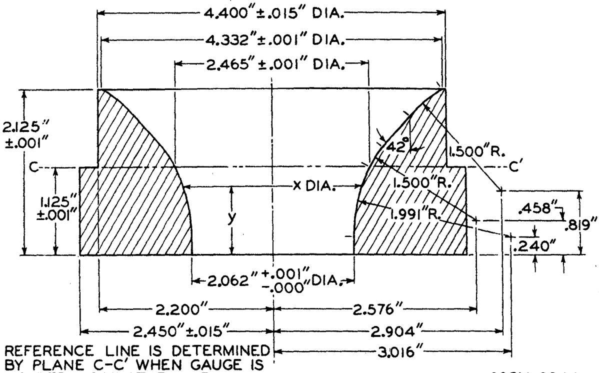
COLOR KINESCOPE

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



REFERENCE LINE IS DETERMINED BY PLANE C-C' WHEN GAUGE IS SEATED AGAINST FUNNEL

92CM-8844

y	x	y	x
0.000"	2.062" + 0.001" − 0.000"	0.385"	2.062" + 0.001" − 0.000"
0.125"	2.062" + 0.001" − 0.000"	0.500"	2.084" ± 0.001"
0.250"	2.062" + 0.001" − 0.000"	0.625"	2.122" ± 0.001"
0.375"	2.062" + 0.001" − 0.000"	0.750"	2.182" ± 0.001"

21AXP22-A

COLOR KINESCOPE

y	x
0.875"	2.258" ± 0.001"
1.000"	2.352" ± 0.001"
1.125"	2.465" ± 0.001"
1.250"	2.604" ± 0.001"
1.375"	2.778" ± 0.001"
1.500"	2.990" ± 0.001"

y	x
1.625"	3.216" ± 0.001"
1.750"	3.440" ± 0.001"
1.875"	3.678" ± 0.001"
2.000"	3.958" ± 0.001"
2.125"	4.332" ± 0.001"

TUBE DIVISION
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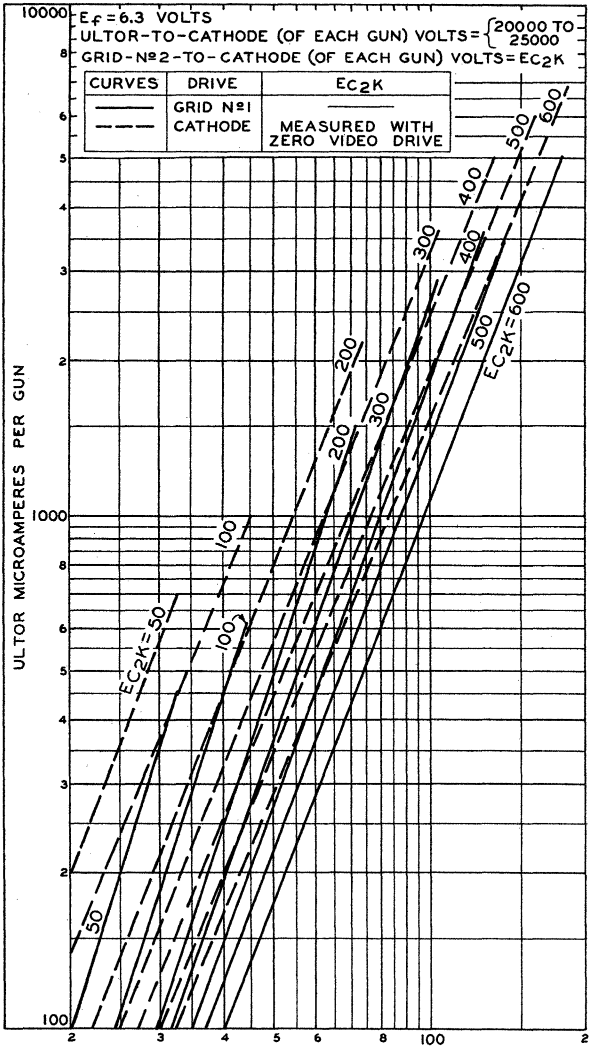
21AXP22-A

RCA

21AXP22-A

TYPICAL DRIVE CHARACTERISTICS



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92CM-8566R1

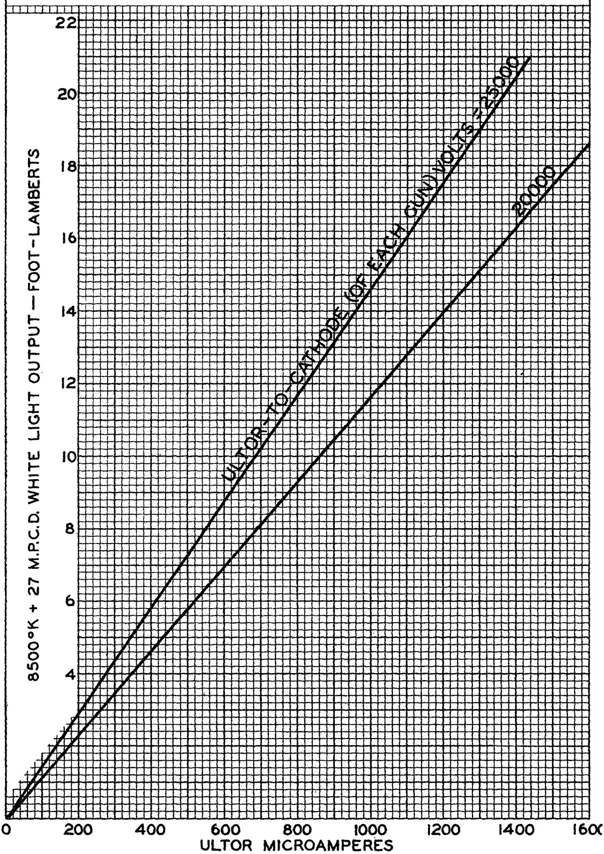
21AXP22-A

TYPICAL LIGHT-OUTPUT CHARACTERISTICS

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

RED GUN: 51%
BLUE GUN: 19%
GREEN GUN: 30%

RASTER SIZE: 19 1/16" x 14 1/2"



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 ± 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" ± 1/8"
  - At flange . . . 20-15/16" ± 5/16"

Weight (Approx.) . . . 28 lbs
Operating Position . . . Tube axis horizontal (Base pin 12 on top)
Ultor Terminal . . . Metal Shell
Socket . . . Alden Nos. 214NMINSC (Radial leads), 214NMINC (Axial leads), or equivalent

♦ For Curves, see front of this Section.

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

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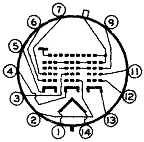
21AXP22-A/21AXP22

COLOR PICTURE TUBE

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

Pin 1 - Heater
Pin 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
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

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

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.

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

21CBP4A

Picture Tube

RECTANGULAR GLASS TYPE | **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS | **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. μμf / 2000 min. μμf
Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

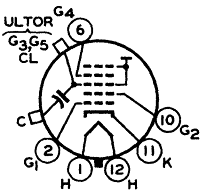
Optical:

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

Mechanical:

Operating Position. . . . . Any
Weight (Approx.). 24 lbs
Overall Length. . . . . 18" ± 3/8"
Neck Length . . . . 5-1/2" ± 3/16"
Projected Area of Screen. . . . . 262 sq. in.
External Conductive Coating:
  Type. . . . . Special
  Contact area for grounding. . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
  See *Picture-Tube Dimensional-Outlines* and *Bulb J171 D/E* sheets at the front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Bases (Alternates):
  Short Small-Shell Duodecal 6-Pin
    (JEDEC Group 4, No.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

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.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor voltage of	*16000*	*volts*
and grid-No.2 voltage of	*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

RCA

21CQP4
PICTURE TUBE

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

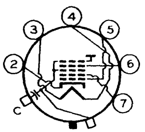
With heater having controlled warm-up time

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.6 ± 5%	amp
Warm-up time (Average)	11	sec
Capacitance between External Conductive Coating and Ultor	2500 max.	$\mu\mu f$
	2000 min.	$\mu\mu f$
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

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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

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

21CYP22

RCA

21CYP22

COLOR PICTURE TUBE

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

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

DATA

General:

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

Heater, for Unipotential Cathode of Each Gun, Paralleled with Each of the Other Two Heaters within Tube:

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	$\mu\mu f$
Cathode of blue gun + cathode of green gun + cathode of red gun to all other electrodes	16	$\mu\mu f$
Grid No.3 (Of each gun tied within tube to No.3 grids of other two guns) to all other electrodes	9	$\mu\mu f$
External conductive coating to grid No.6	2500 max.	$\mu\mu f$
	2000 min.	$\mu\mu f$

Faceplate, Spherical . . . . .Filterglass

Light transmission (Approx.) 72%

Screen, on Inner Surface of Faceplate:

Type . . . . Aluminized, Tricolor, Phosphor-Dot

Phosphor (Three separate phosphors, collectively). P22

Fluorescence and phosphorescence of separate phosphors, respectively . . . Blue, Green, Red

Persistence of group phosphorescence . . . . Medium

Dot arrangement. . . . . Triangular group consisting of blue dot, green dot, and red dot

Spacing between centers of adjacent dot trios (Approx.) 0.029"

Size (Minimum):

Greatest width . . . . 19-1/4"

Height . . . . 15-1/2"

Projected area . . . . 261 sq. in.

Focusing Method. . . . . Electrostatic

Convergence Method . . . . Magnetic

Deflection Method. Magnetic

Deflection Angles (Approx.):

Horizontal . . . . 70°

Vertical . . . . 55°

Tube Dimensions:

Overall length . . . . 25-1/32" ± 3/8"

Diameter . . . . 20-13/16" ± 1/8"

Weight (Approx.) . . . . 36-1/2 lbs

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

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

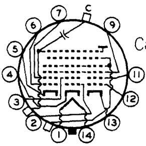
RCA

21CYP22

COLOR PICTURE TUBE

Caps (Two). . . . . . . .Recessed Small Cavity (JETEC No.J1-21)
Socket. . . . . Alden Nos.214NMINSC (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 2 - Grid No.1 of Red Gun
Pin 3 - Grid No.2 of Red Gun
Pin 4 - Cathode of Red Gun
Pin 5 - Cathode of Green Gun
Pin 6 - Grid No.1 of Green Gun
Pin 7 - Grid No.2 of Green Gun
Pin 9 - Grid No.3
Pin 11 - Grid No.2 of Blue Gun
Pin 12 - Grid No.1 of Blue Gun



Pin 13 - Cathode of Blue Gun
Pin 14 - Heater
Cap Over Pin 1 - Ultor (Grid No.4, Grid No.5)
Cap♦ Over Pin 2 - Grid No.6, Collector, High-Voltage-Supply Terminal
C - External Conductive Coating

Maximum Ratings, *Design-Center Values:*

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

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

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

Equipment Design Ranges:

With ultor voltage ($E_{c_4k\ \text{each gun}}$) between 20000# and 25000 volts

Grid-No.3 (Focusing Electrode)-to-Cathode (Of each gun) Voltage .	16.8% to 20% of $E_{c_4k\ \text{each gun}}$	volts

♦,#: See next page.

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

21CYP22

COLOR PICTURE TUBE

Grid-No.2-to-Cathode Voltage (Each gun) when circuit design utilizes grid-No.1-to-cathode voltage (E_{c_1k}) at fixed value for raster cutoff.	*See Cutoff Design Chart*		
Grid-No.1-to-Cathode Voltage (Each gun) for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2-to-cathode voltage (E_{c_2k}) at fixed value.	*See Cutoff Design Chart*		
Variation in Raster Cutoff Between Guns in Any Tube.	± 21% of average of highest and lowest cutoff values		
Grid-No.3 Current.	-45 to +45		μa
Grid-No.2 Current (Each gun) . .	-5 to +5		μa
Percentage of Total Ultor Current Supplied by Each Gun:			
To Produce White of 8500° K + 27 M.P.C.D. (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.

ELECTRON TUBE DIVISION
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RCA

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 parabola 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.

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

Examples of Use of Design Ranges:

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

Limiting Circuit Values:

High-Voltage Circuits:

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

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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 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 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.

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COLOR PICTURE TUBE

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

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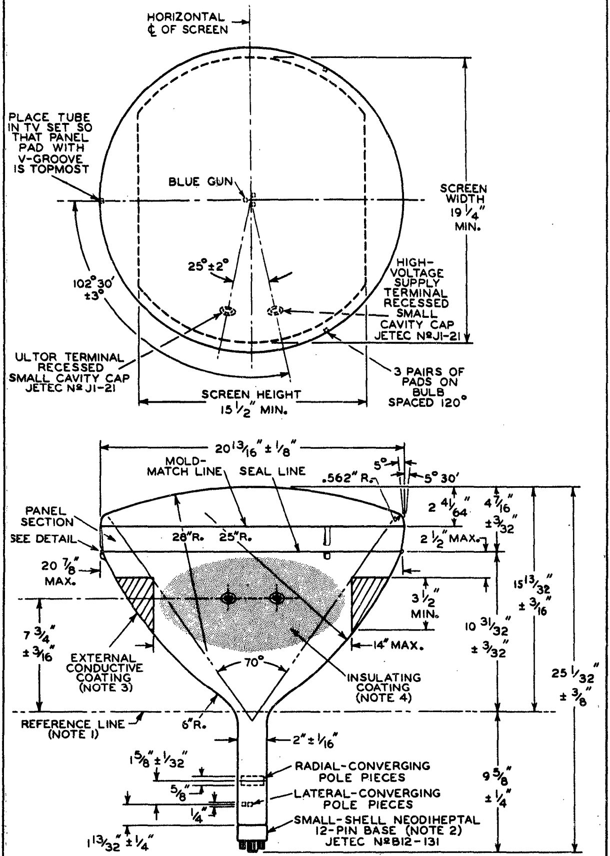
RCA

21CYP22

COLOR PICTURE TUBE



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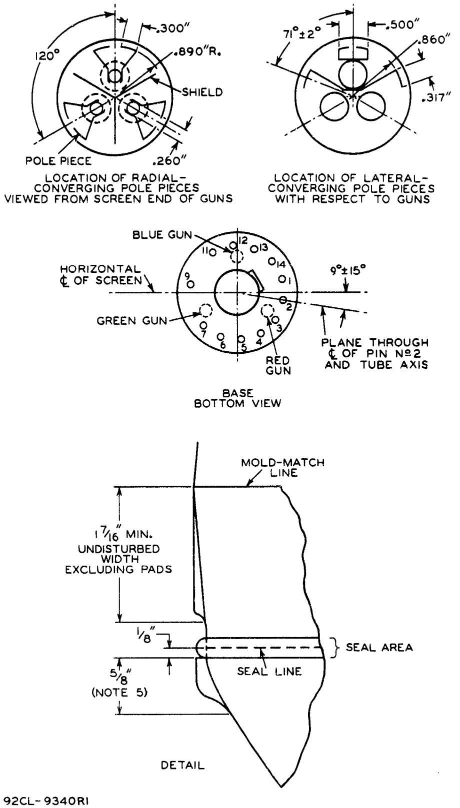
21CYP22

COLOR PICTURE TUBE



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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".

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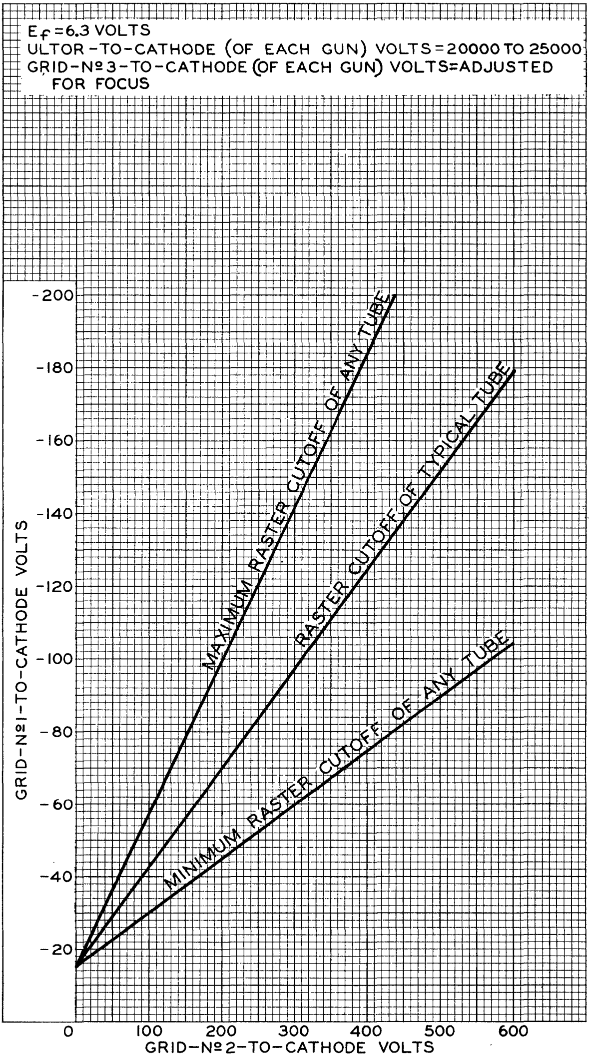
21CYP22

CUTOFF DESIGN CHART



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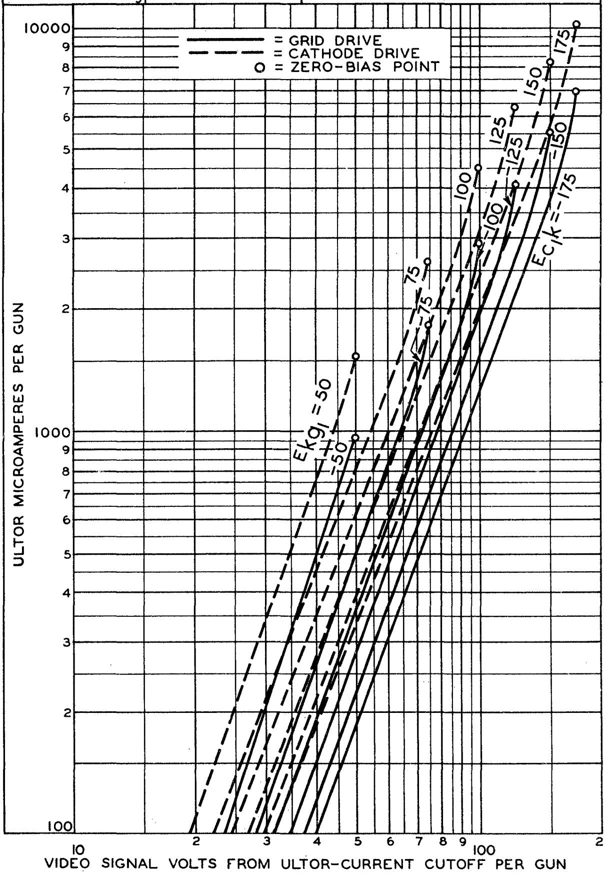
21CYP22

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 CUT-OFF FOR DESIRED FIXED CATHODE-TO-GRID-№1 (EACH GUN) VOLTAGE (E_{kg_1})	GRID-№2-TO-CATHODE VOLTS (EACH GUN) = ADJUSTED TO PROVIDE ULTOR-CURRENT CUT-OFF FOR DESIRED FIXED GRID-№1-TO-CATHODE (EACH GUN) VOLTAGE (E_{c_1k})



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92CL-9421

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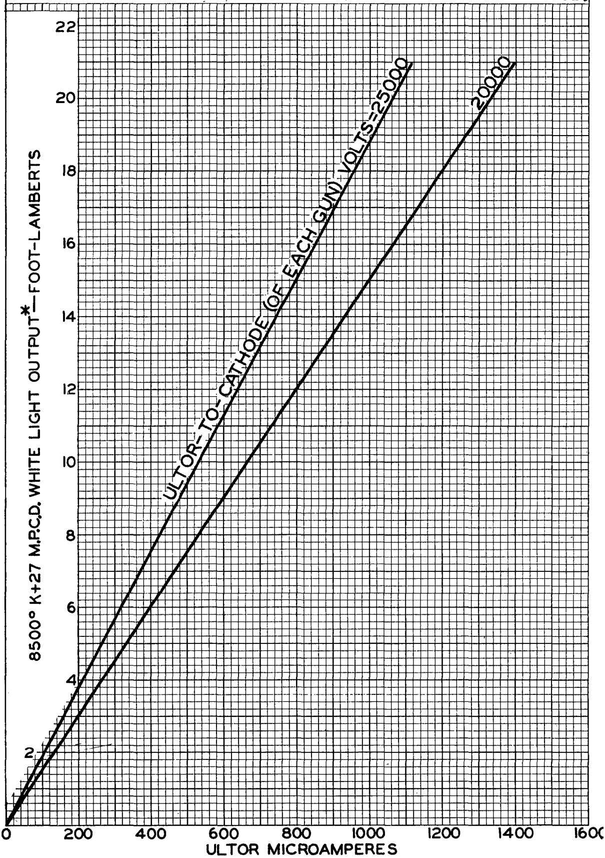
21CYP22

TYPICAL LIGHT-OUTPUT CHARACTERISTICS

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

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

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



21CYP22-A

Color Picture Tube

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

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

Supersedes Type 21CYP22

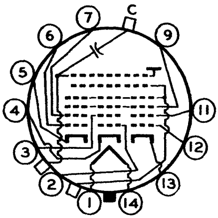
DATA

General:

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

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

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



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

Maximum Ratings, *Design-Center Values:*

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

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

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

Equipment Design Ranges:

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

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

Ratios of Cathode Currents: *To Produce White of 8500° K + 27 M.P.C.D. (CIE Coordinates x = 0.287, y = 0.316):*•	*Min.*	*Typical*	*Max.*
Red cathode to green cathode. . . .	1.2	1.5	1.8
Red cathode to blue cathode	2.1	2.7	3.3

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

Maximum Required Displacements of Beam Trios with Respect to Associated Phosphor-Dot Trios:
  Uniform in any direction over entire screen area . . . . .0.005"♠
Adjustment to be Provided by the Following Components:
  Lateral-Converging Magnet:♣,⊕
    Maximum lateral shift of blue beam . . . . ±1/4"
    Maximum lateral shift of red beam and green beam . . . . ±1/8" to ±3/8"
    Average of maximum lateral shift of red beam and green beam . . . . ±7/32" to ±9/32"
  Radial-Converging Magnet Assembly:♣
    For static convergence including compensation for dc component of dynamic convergence (Each beam). . . . . Shift of ±5/8"
    For dynamic convergence#—
      Effected by magnetomotive force of parabolic and/or sawtooth waveshape synchronized with scanning.

Horizontal:

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

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

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

Vertical:

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

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

Examples of Use of Design Ranges:

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

Limiting Circuit Values:

High-Voltage Circuits:

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

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

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

Low-Voltage Circuits:

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

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

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

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

● For Curves, see front of this Section.

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

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

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

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

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

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

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

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

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

DEFINITIONS

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

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

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

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

GENERAL CONSIDERATIONS

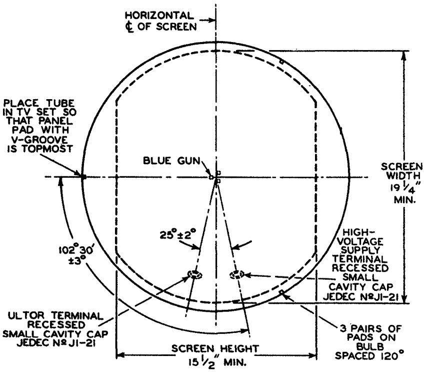
X-Ray-Warning. Because this color picture tube is designed to be operated at ultor voltages as high as 25 kilovolts (Design-center maximum value), shielding of this color picture tube for X-ray radiation may be needed to protect against possible injury from prolonged exposure at close range.

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

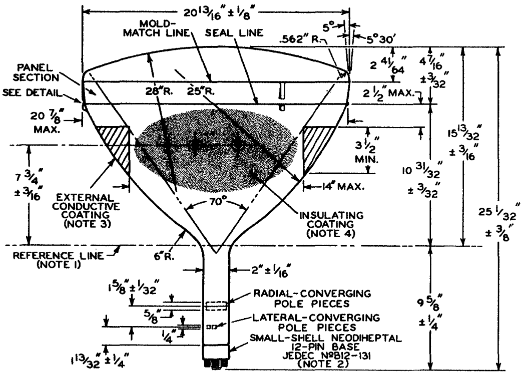
High Voltages. The high voltages at which cathode-ray tubes are operated may be very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with the high voltages. Precautions include the inclosing of high-potential terminals and the use of interlocking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

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

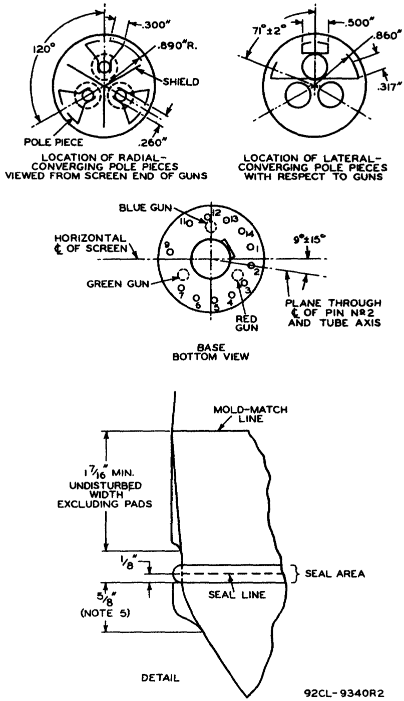
21CYP22-A



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



20 13/16" ± 1/8"
MOLD-MATCH LINE
SEAL LINE
.562" R.
5°
5°30'
PANEL SECTION
SEE DETAIL
28"R.
25"R.
2 41/64"
4 7/16" ± 3/32"
2 1/2" MAX.
20 7/8" MAX.
3 1/2" MIN.
15 13/32" ± 3/16"
10 31/32" ± 3/32"
25 1/32" ± 3/8"
7 3/4" ± 3/16"
EXTERNAL CONDUCTIVE COATING (NOTE 3)
14" MAX.
70°
INSULATING COATING (NOTE 4)
REFERENCE LINE (NOTE 1)
6"R.
2" ± 1/16"
1 5/8" ± 1/32"
RADIAL-CONVERGING POLE PIECES
5/8"
LATERAL-CONVERGING POLE PIECES
1/4"
SMALL-SHELL NEODIHEPTAL 12-PIN BASE JEDEC Nº B12-131 (NOTE 2)
1 13/32" ± 1/4"
9 5/8" ± 1/4"


.300"
120°
.890"R.
SHIELD
POLE PIECE
.260"
LOCATION OF RADIAL-CONVERGING POLE PIECES VIEWED FROM SCREEN END OF GUNS
71°±2°
.500"
.860"
.317"
LOCATION OF LATERAL-CONVERGING POLE PIECES WITH RESPECT TO GUNS
BLUE GUN
HORIZONTAL ℄ OF SCREEN
GREEN GUN
RED GUN
9°±15°
PLANE THROUGH ℄ OF PIN Nº2 AND TUBE AXIS
BASE BOTTOM VIEW
MOLD-MATCH LINE
1 7/16" MIN. UNDISTURBED WIDTH EXCLUDING PADS
1/8"
SEAL AREA
SEAL LINE
5/8" (NOTE 5)
DETAIL
92CL-9340R2

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.

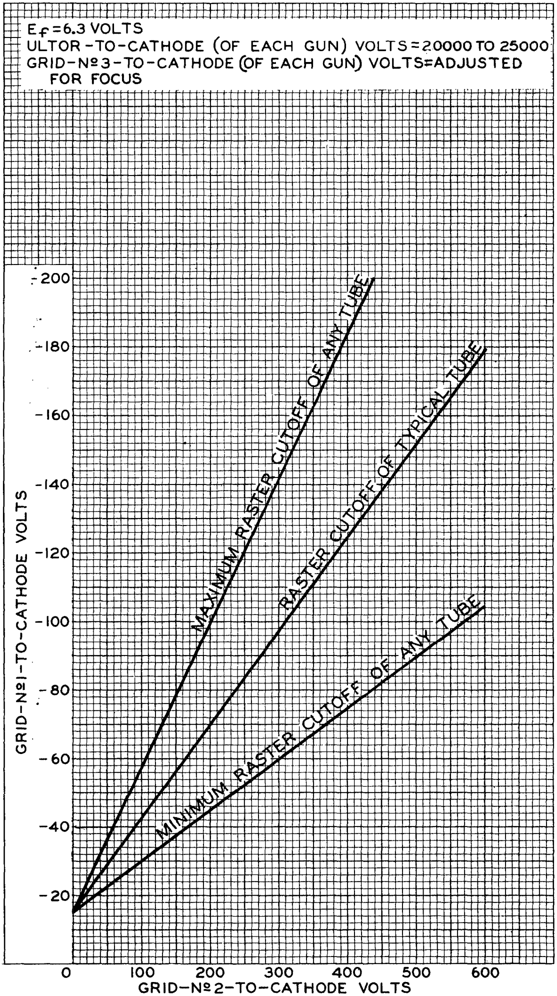
NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

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".

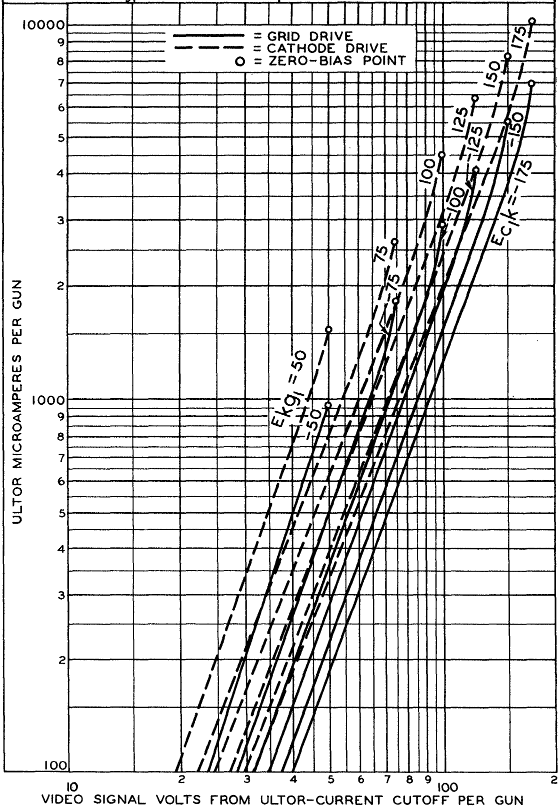
CUTOFF DESIGN CHART



92CM-8565R1

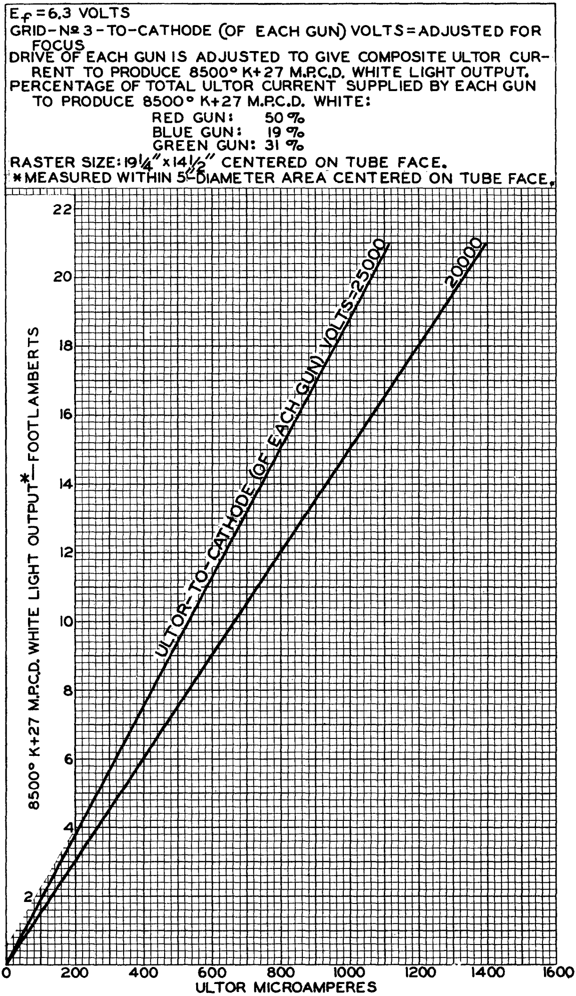
TYPICAL DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-Nº1 (OF EACH GUN) VOLTS = 20000 TO 25000 GRID-Nº3-TO-GRID-Nº1 (OF EACH GUN) VOLTS = ADJUSTED FOR FOCUS GRID-Nº2-TO-GRID-Nº1 VOLTS (EACH GUN) = ADJUSTED TO PROVIDE ULTOR-CURRENT CUT-OFF FOR DESIRED FIXED CATHODE-TO-GRID-Nº1 (EACH GUN) VOLTAGE (E_{kg_1})	E_f = 6.3 VOLTS ULTOR-TO-CATHODE (OF EACH GUN) VOLTS = 20000 TO 25000 GRID-Nº3-TO-CATHODE (OF EACH GUN) VOLTS = ADJUSTED FOR FOCUS GRID-Nº2-TO-CATHODE VOLTS (EACH GUN) = ADJUSTED TO PROVIDE ULTOR-CURRENT CUT-OFF FOR DESIRED FIXED GRID-Nº1-TO-CATHODE (EACH GUN) VOLTAGE (E_{c_1k})



92CL-9421

TYPICAL LIGHT-OUTPUT CHARACTERISTICS



92CM-9417

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	$\mu\mu f$
Cathode to all other electrodes	5	$\mu\mu f$
External conductive coating to ultor	2500 max. / 2000 min.	$\mu\mu f$
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" ± 5/16"	
Greatest width	20-1/4" ± 1/8"	
Greatest height	16-3/8" ± 1/8"	
Diagonal	21-3/8" ± 1/8"	
Neck length	5-7/16" + 3/16" − 1/8"	
Radius of curvature of faceplate (External surface)	28-1/2"	
Screen Dimensions (Minimum):		
Greatest width	19-1/16"	
Greatest height	15-1/16"	
Diagonal	20-1/4"	
Projected area	262 sq. in.	
Weight (Approx.)	22 lbs	
Operating Position	Any	
Cap	Recessed Small Cavity (JEDEC No.J1-21)	
Bulb	J171G1/K1	
Base	Small-Button Eightar 7-Pin, Arrangement 2, (JEDEC No.B7-183)	

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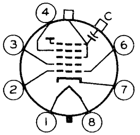
21DEP4-A

PICTURE TUBE

Basing Designation for BOTTOM VIEW. 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



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

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE.	20000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE.	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-peak value.	200 max.	volts
Negative-bias value.	140 max.	volts
Positive-bias value.	0 max.	volts
Positive-peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c_5k}) between 15000⊕ and 20000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus§ . . .	0 to 500	volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive).	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current.	-25 to +25	μa
Grid-No.2 Current.	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

21DEP4-A
PICTURE TUBE

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*volts*
and grid-No.2 voltage of	*400*	*volts*
Grid-No.4 Voltage for focus. . .	0 to 500	volts
Grid-No.1 Voltage for visual extinction of focused raster	-36 to -94	volts
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value.	36 to 94	volts

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	20000 max.	volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	640 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive-peak value.	200 max.	volts
Positive-bias value.	140 max.	volts
Negative-bias value.	0 max.	volts
Negative-peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5 g_1}$) between 15000✠ and 20000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2 g_1}$) between 225 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§	0 to 500	volts
Cathode-to-Grid-No.1 Voltage (Ekg_1) for visual extinction of focused raster.	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	

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PICTURE TUBE

Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for Ekg_1 except video drive is a negative voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	0 to 500	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	36 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	-36 to -78	volts

Maximum Circuit Values:

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

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

✠ Brightness and focus quality decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 15,000 volts.

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

* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

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

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

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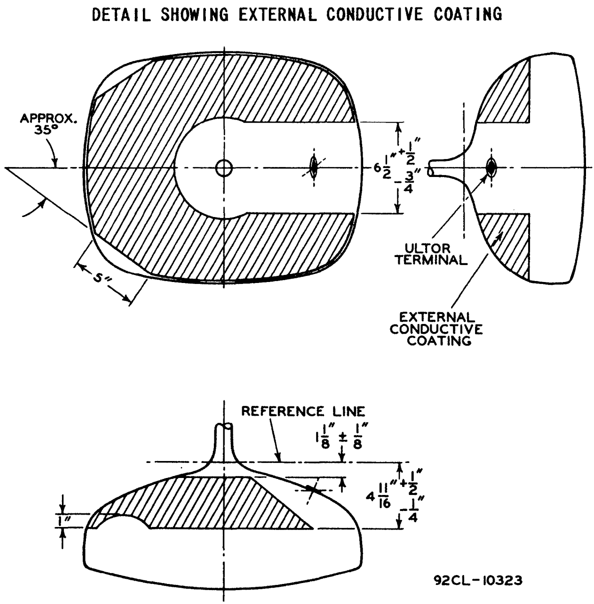
21DEP4-A
PICTURE TUBE



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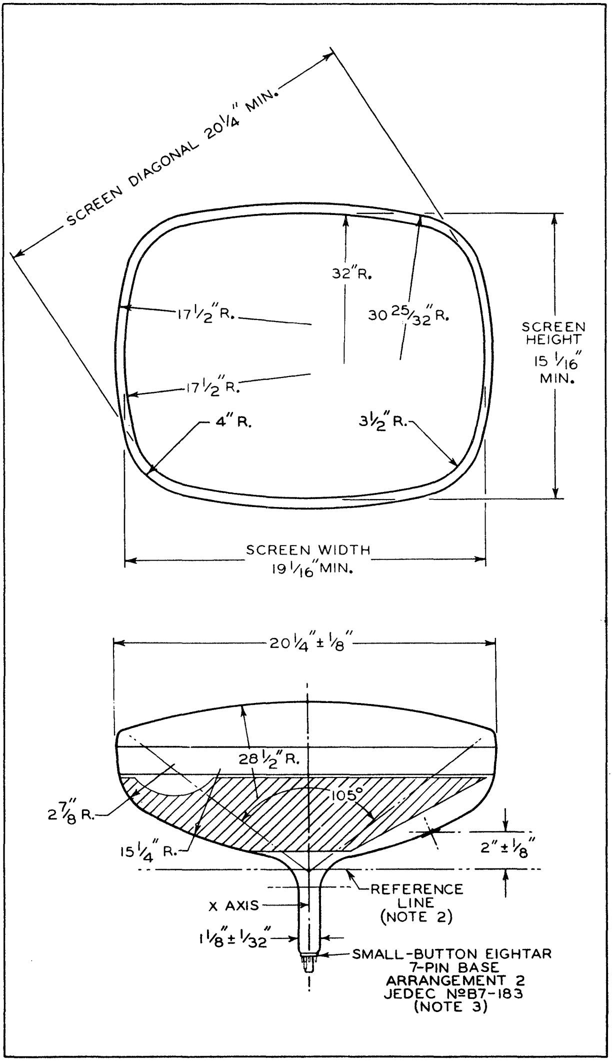
PICTURE TUBE



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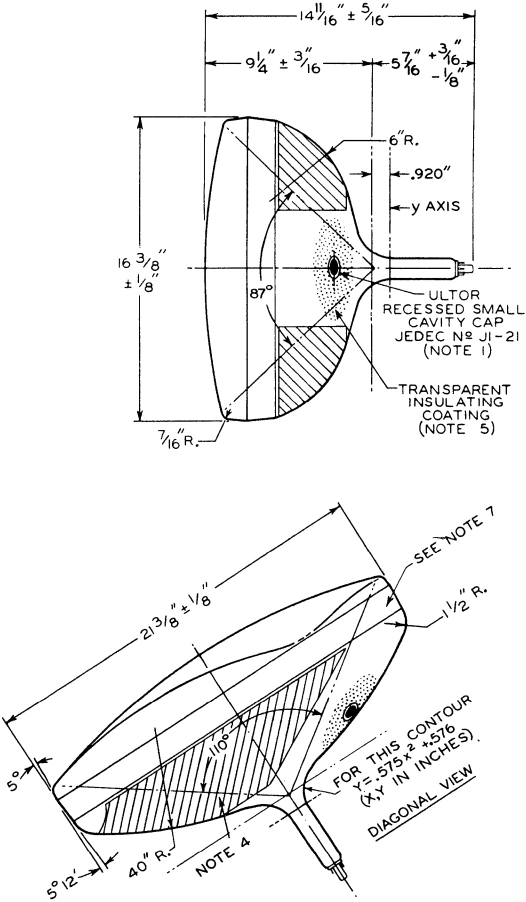
21DEP4-A

PICTURE TUBE



92CL-10329

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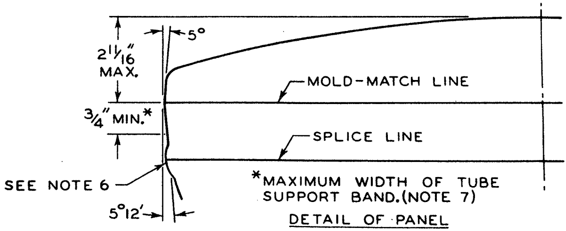
PICTURE TUBE



DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-126 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUITRY CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

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

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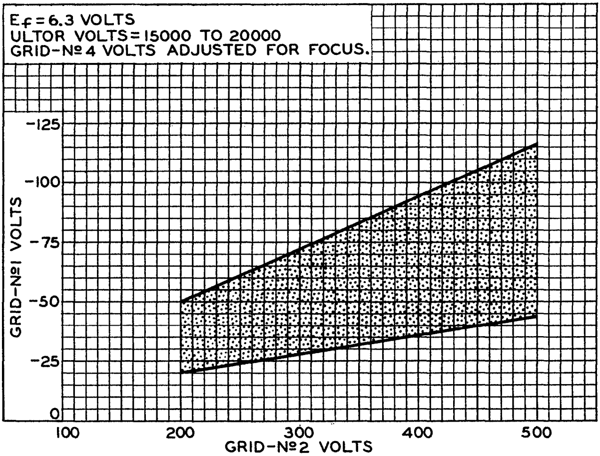
21DEP4-A

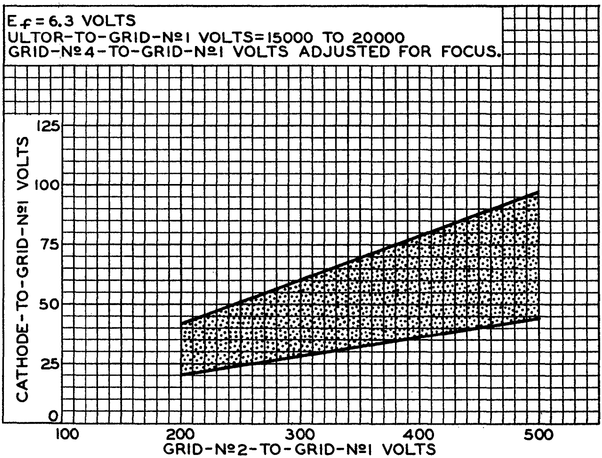
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



92CS-10324

CATHODE-DRIVE SERVICE



92CS-10325

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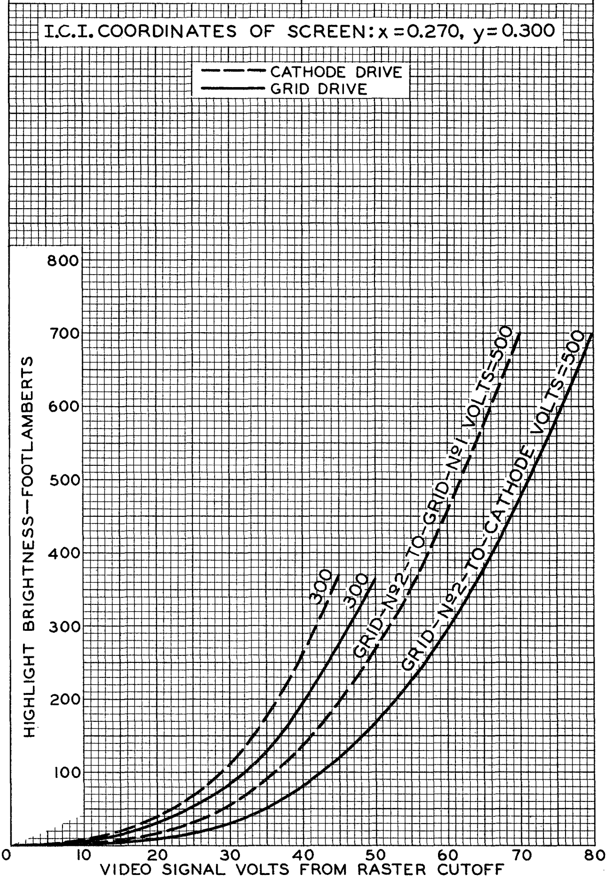
21DEP4-A

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 13½"	RASTER SIZE = 18" x 13½"



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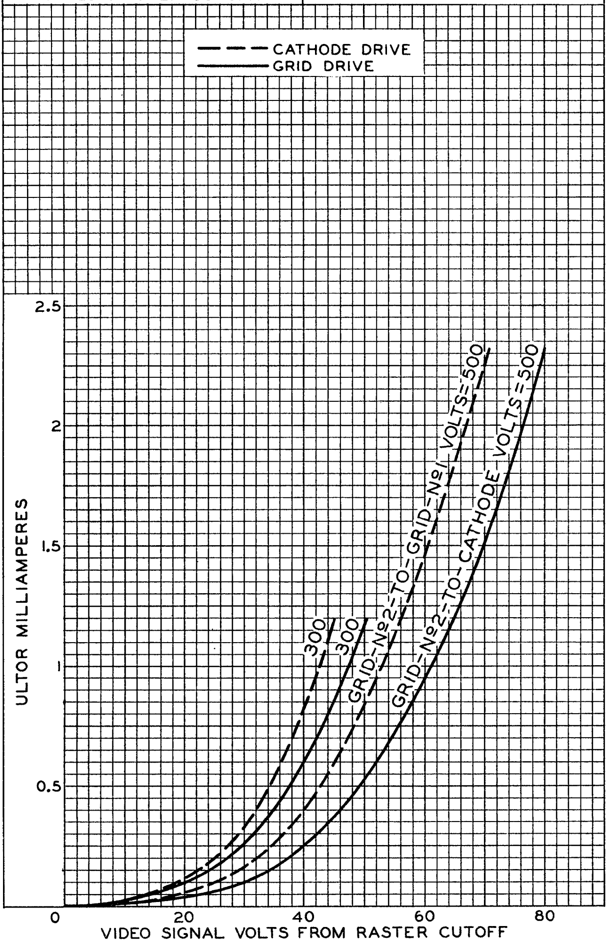
21DEP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f=6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS = 15000 TO 20000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 6.3 VOLTS ULTOR VOLTS = 15000 TO 20000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



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21DFP4
PICTURE TUBE

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

DATA

General:

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

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . . 6 $\mu\mu$f
- Cathode to all other electrodes . . . . . 5 $\mu\mu$f
- External conductive coating to ultor. . . {2200 max. $\mu\mu$f; 1500 min. $\mu\mu$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

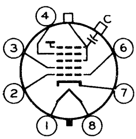
Focusing Method . . . . Electrostatic
Deflection Method .Magnetic
Deflection Angles (Approx.):
- Diagonal. . . . . 110^{o}
- Horizontal. . . . . 105^{o}
- Vertical. . . . . 87^{o}

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet
Tube Dimensions:
- Overall length. . . . . 14-7/16" ± 5/16"
- Greatest width. . . . . 20-1/4" ± 1/8"
- Greatest height . . . . 16-3/8" ± 1/8"
- Diagonal. . . . . 21-3/8" ± 1/8"
- Neck length . . . . 5-7/16" ± 1/8"

Screen Dimensions (Minimum):
- Greatest width. . . . . 19-1/16"
- Greatest height . . . . 15-1/16"
- Diagonal. . . . . 20-1/4"
- Projected area. . . . . 262 sq. in.

Weight (Approx.). . . . . 23 lbs
Operating Position. . . . . Any
Cap . . . . .Recessed Small Cavity (JETEC No.J1-21)
Bulb. . . . . J171 (110^{o})
Socket. . . . . Ucinite Part No.115446, or equivalent
Base. . . . . Small-Button Eightar 7-Pin, Arrangement 2, (JETEC No.B7-183)
- Basing Designation for BOTTOM VIEW. 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



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

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21DFP4

PICTURE TUBE

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	18000	max.	volts
	12000⊕	min.	volts
GRID-No.4 VOLTAGE:			
Positive value	1000	max.	volts
Negative value	500	max.	volts
GRID-No.2 VOLTAGE	500	max.	volts
GRID-No.1 VOLTAGE:			
Negative peak value	200	max.	volts
Negative bias value	140	max.	volts
Positive bias value	0	max.	volts
Positive peak value	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	180	max.	volts
Heater positive with respect to cathode	180	max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c_5k}) between 12000 and 18000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

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

PICTURE TUBE

Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value.	28 to 72	36 to 94	volts

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	18000	max.	volts
	12000⊕	min.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:			
Positive value	1000	max.	volts
Negative value	500	max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	640	max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500	max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:			
Positive peak value.	200	max.	volts
Positive bias value.	140	max.	volts
Negative bias value.	0	max.	volts
Negative peak value.	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5 g_1}$) between 12000 and 18000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2 g_1}$) between 225 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster.	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative).	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No.4 Current.	-25 to +25	μa

▲,⊕,§,*,■: See next page.

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PICTURE TUBE

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

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*14000*	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus.	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster.	28 to 60	36 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value.	-28 to -60	-36 to -78	volts

Maximum Circuit Values:

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

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

⊕ This value is a working design-center minimum. The equivalent *absolute minimum* ultor-, or ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 21DFP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor-, or ultor-to-grid-No.1 voltage is never less that 11,000 volts.

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

* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

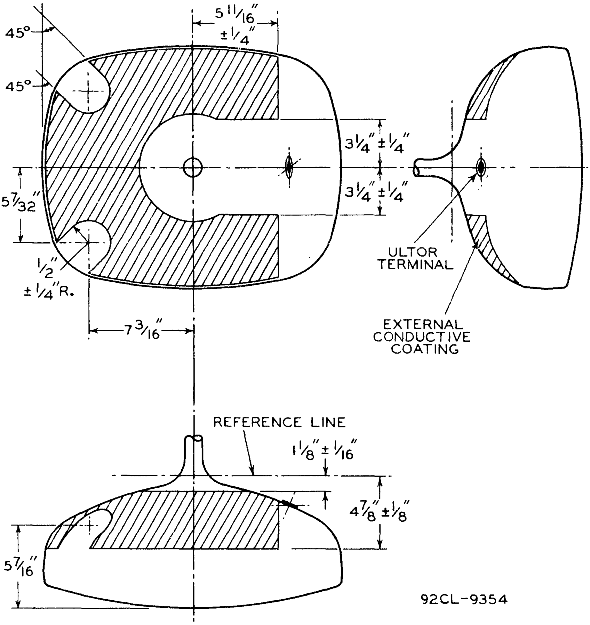
■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

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

Curves and Charts shown under Type 21CEP4 also apply to the 21DFP4

21DFP4
PICTURE TUBE

DETAIL SHOWING EXTERNAL CONDUCTIVE COATING



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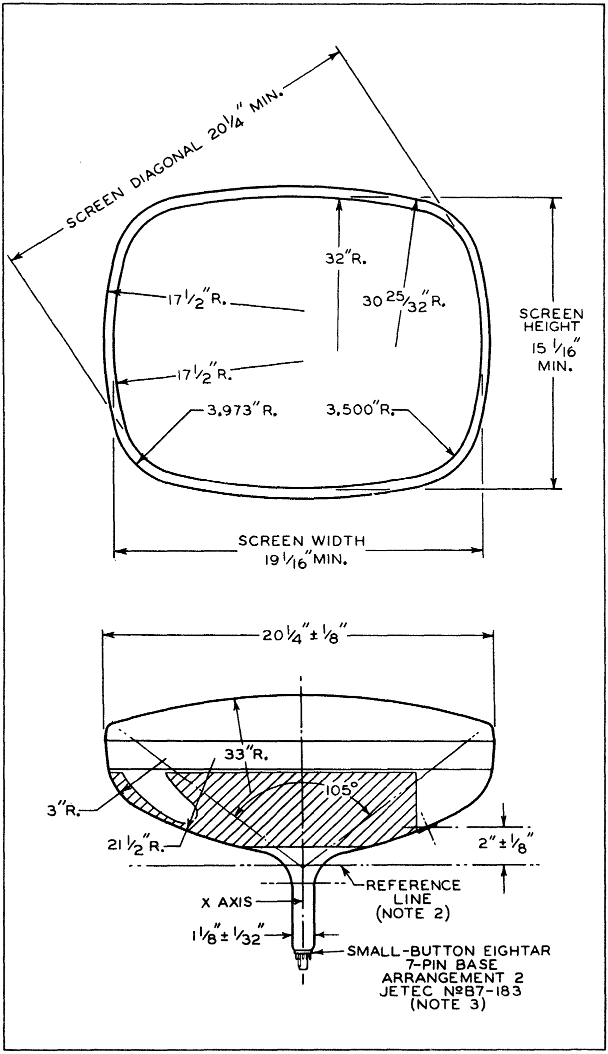
21DFP4

RCA

21DFP4
PICTURE TUBE



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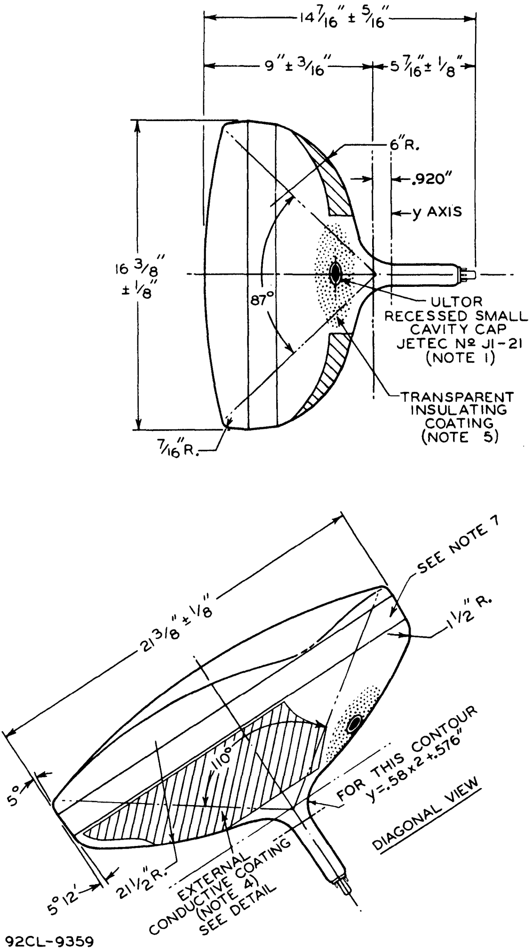
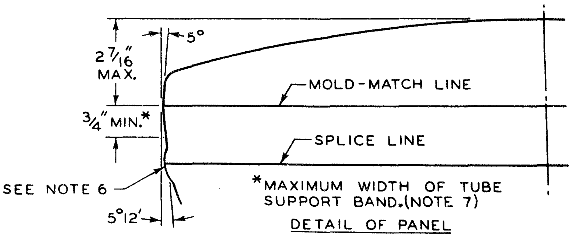
21DFP4

PICTURE TUBE



21DFP4
PICTURE TUBE



DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE 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.

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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	$\mu\mu$f
Cathode to all other electrodes. . . .	5	$\mu\mu$f
External conductive coating to ultor .	2500 max.	$\mu\mu$f
	1700 min.	$\mu\mu$f

Electron Gun . . . . .Type Requiring No Ion-Trap Magnet

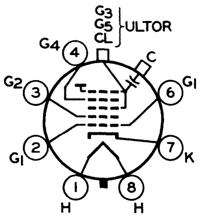
Optical:

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

Mechanical:

Operating Position . . . . .Any
Weight (Approx.) . . . . 20 lbs
Overall Length . . . . 14-11/16" + 5/16" - 5/8"
Neck Length. . . . . 5-7/16" + 1/8" - 7/16"
Projected Area of Screen . . . . 262 sq. in.
External Conductive Coating:
Type . . . . Regular Band
Contact area for grounding . . . . .Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines* and *Bulb J171 G/K* sheets at the front of this section
Cap. . . . . Recessed Small Cavity (JEDEC No.J1-21)
Bases (Alternates):
Small-Button Eightar 7-Pin, Arrangement 2, (JEDEC No.B7-183)
Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)
Basing Designation for BOTTOM VIEW 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



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

Maximum Ratings, *Design-Maximum Values:*

ULTOR VOLTAGE	19800 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	154 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor voltage of	*16000*	*volts*
and grid-No.2 voltage of	*300*	*volts*
Grid-No.4 Voltage for focus	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster	-35 to -72	volts

Maximum Circuit Values:

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

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

21DLP4
PICTURE TUBE

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

DATA

General:

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

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . 6 μμf
- Cathode to all other electrodes . . . 5 μμf
- External conductive coating to ultor . . . 2500 max. μμf; 2000 min. μμf

Faceplate, Spherical . . . Filterglass
- Light transmission (Approx.) . . . 74%

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

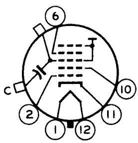
Focusing Method . . . Electrostatic
Deflection Method . . . Magnetic
Deflection Angles (Approx.):
- Diagonal . . . 90°
- Horizontal . . . 85°
- Vertical . . . 68°

Electron Gun . . . Type Requiring No Ion-Trap Magnet
Tube Dimensions:
- Overall length . . . 17" ± 3/8"
- Greatest width . . . 20-1/4" ± 1/8"
- Greatest height . . . 16-3/8" ± 1/8"
- Diagonal . . . 21-3/8" ± 1/8"
- Neck length . . . 4-1/2" ± 3/16"

Screen Dimensions (Minimum):
- Greatest width . . . 19-1/16"
- Greatest height . . . 15-1/16"
- Diagonal . . . 20-1/4"
- Projected area . . . 262 sq. in.

Weight (Approx.) . . . 24 lbs
Operating Position . . . Any
Cap . . . Recessed Small Cavity (JETEC No.J1-21)
Bulb . . . J171D2/E1
Base . . . Short Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-203), or Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-63)
- Basing Designation for BOTTOM VIEW . . . 12L

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



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

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

Equipment Design Ranges:

With any ultor voltage (Ec_5k) between 12000 and 20000 volts and grid-No.2 voltage (Ec_2k) between 200 and 500 volts

Grid-No.4 Voltage for focus§	-50 to +400	volts
Grid-No.1 Voltage (Ec_1k) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	Same value as determined for Ec_1k except video drive is a positive voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*volts*
and grid-No.2 voltage of	*300*	*volts*
Grid-No.4 Voltage for focus	0 to 400	volts

▲,✠,§,*: See next page.

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PICTURE TUBE

Grid-No.1 Voltage for visual extinction of focused raster	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value.	28 to 72	volts

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

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

ULTOR-TO-GRID-No.1 VOLTAGE	20000	max.	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§	0 to 450	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster.	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	

▲,✠,§,*,■: See next page.

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PICTURE TUBE

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

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	28 to 60	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value	−28 to −60	volts

Maximum Circuit Values:

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

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

✠ This value is a working design-center minimum. The equivalent *absolute minimum* ultor- or ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 21DLP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor- or ultor-to-grid-No.1 voltage is never less than 11,000 volts.

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

* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 7/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

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

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

RCA

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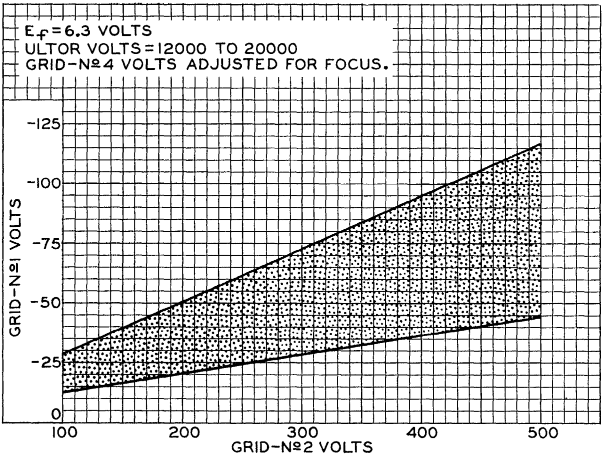
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



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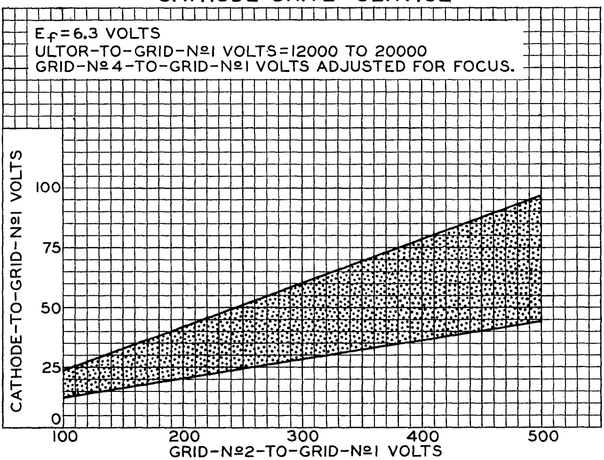
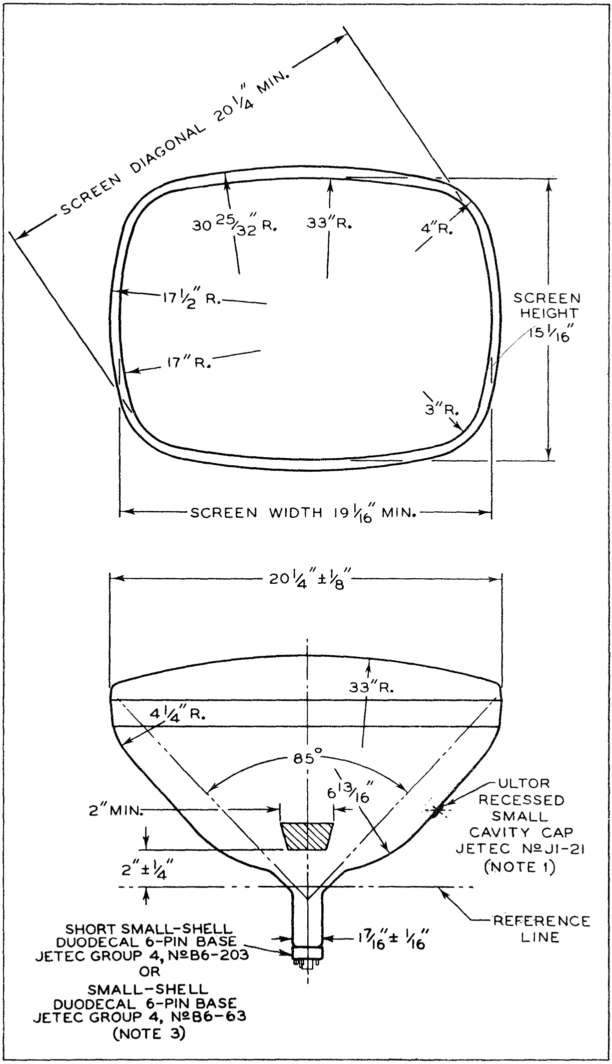
CATHODE-DRIVE SERVICE



92CS-9350V

RCA

21DLP4
PICTURE TUBE



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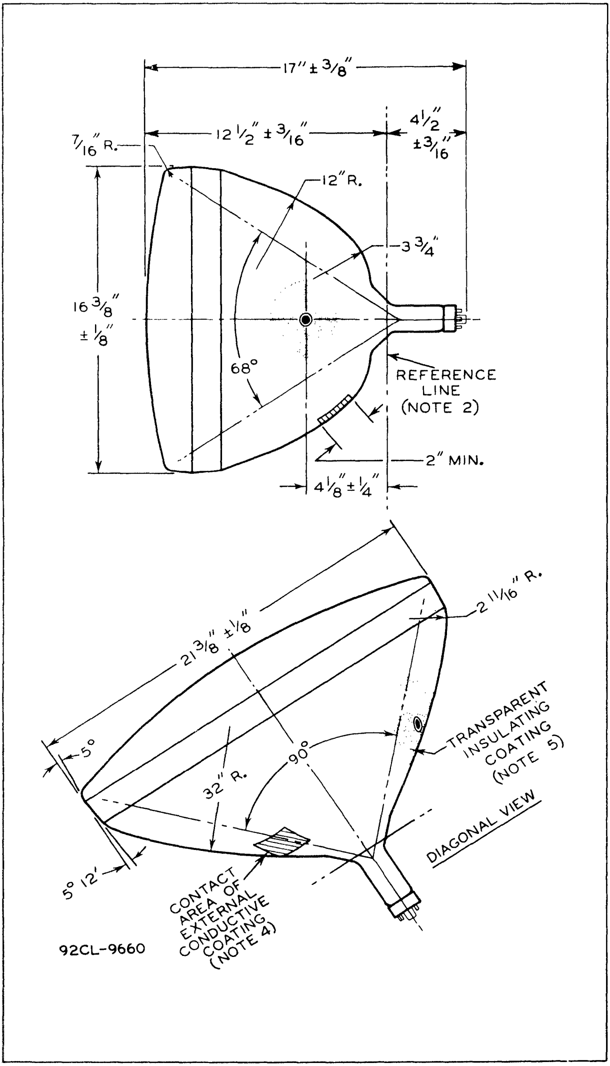
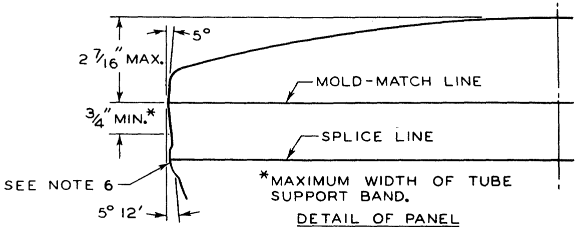
21DLP4
PICTURE TUBE



RCA

21DLP4

PICTURE TUBE



DETAIL OF PANEL

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

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

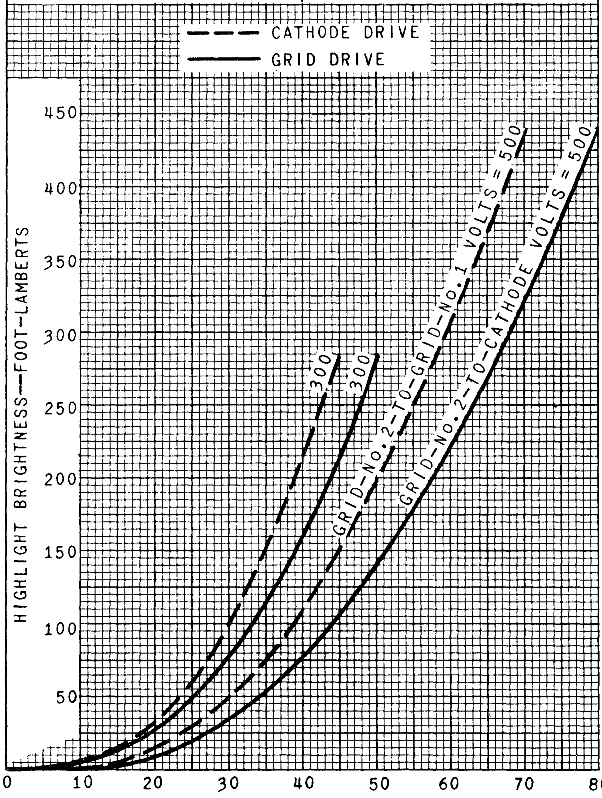
NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

21DLP4
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS 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 = 18"x13-1/2"	E_f = 6.3 VOLTS ULTOR VOLTS = 16000 GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS. RASTER SIZE = 18"x13-1/2"



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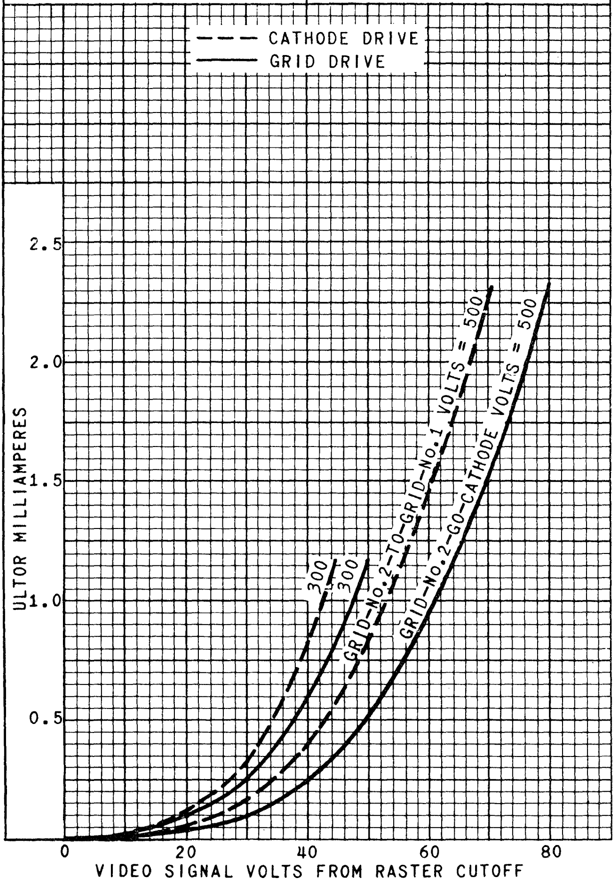
RCA

21DLP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-No.1 VOLTS = 12000 TO 20000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 6.3 VOLTS ULTOR VOLTS = 12000 TO 20000 GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



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92CS-9351

21DSP4

21DSP4

PICTURE TUBE

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	$\mu\mu f$
Cathode to all other electrodes	5	$\mu\mu f$
External conductive coating to ultor	2500 max.	$\mu\mu f$
	2000 min.	$\mu\mu f$
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" ± 3/8"
Greatest width		20-1/4" ± 1/8"
Greatest height		16-3/8" ± 1/8"
Diagonal		21-3/8" ± 1/8"
Neck length		5-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)		33"
Screen Dimensions (Minimum):		
Greatest width		19-1/16"
Greatest height		15-1/16"
Diagonal		20-1/4"
Projected area		262 sq. in.
Weight (Approx.)		24 lbs
Operating Position		Any
Cap		Recessed Small Cavity (JEDEC No.J1-21)
Bulb		J171 D2/E1
Base		Small-Shell Duodecal 6-Pin, Arrangement 1 (JEDEC Group 4, No.B6-63), or Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)

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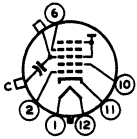
PICTURE TUBE

Basing Designation for BOTTOM VIEW. 12L

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



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

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.	64	max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	64	max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:			
Positive-peak value	200	max.	volts
Positive-bias value	140	max.	volts
Negative-bias value	0	max.	volts
Negative-peak value	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds.	410	max.	volts
After equipment warm-up period. . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g1}) between 12000 and 20000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 40 and 64 volts

Grid-No.4-to-Grid-No. Voltage for focus§.	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level):		
White-level value (Peak negative)	Same value as determined for E_{kg1} except video drive is a negative voltage	

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PICTURE TUBE

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

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*50*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	0 to 350	volts
Cathode-to-Grid-No.1 Voltage♦ for visual extinction of focused raster	32 to 47	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	-32 to -47	volts

Maximum Circuit Values:

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

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

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_{kg_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

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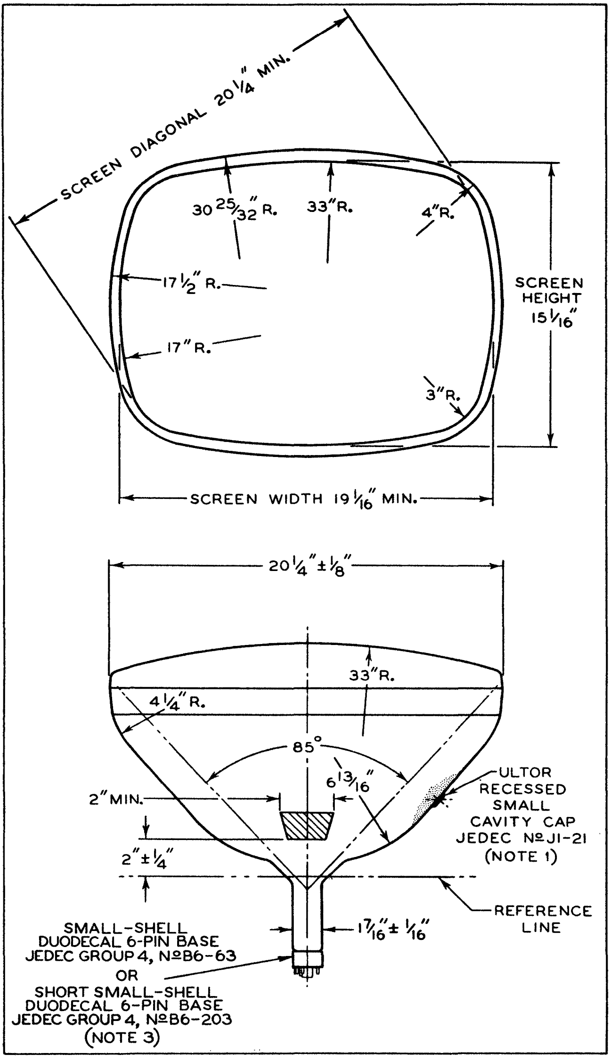
PICTURE TUBE



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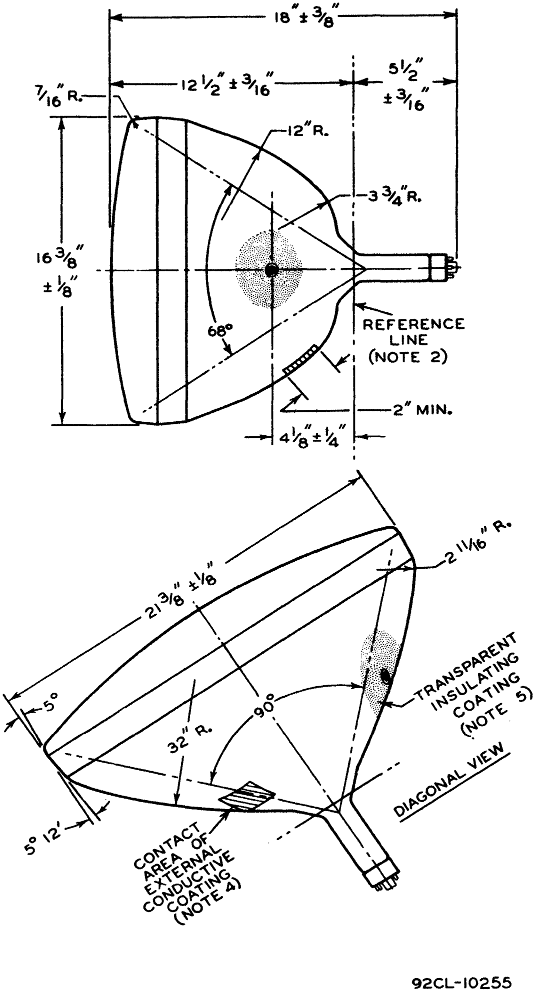
PICTURE TUBE



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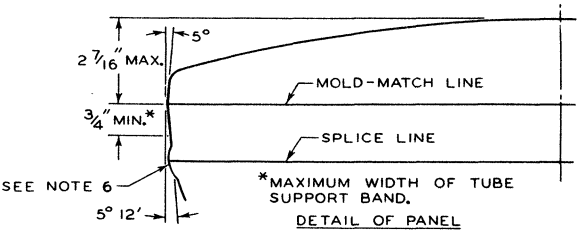
PICTURE TUBE



DETAIL OF PANEL

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

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

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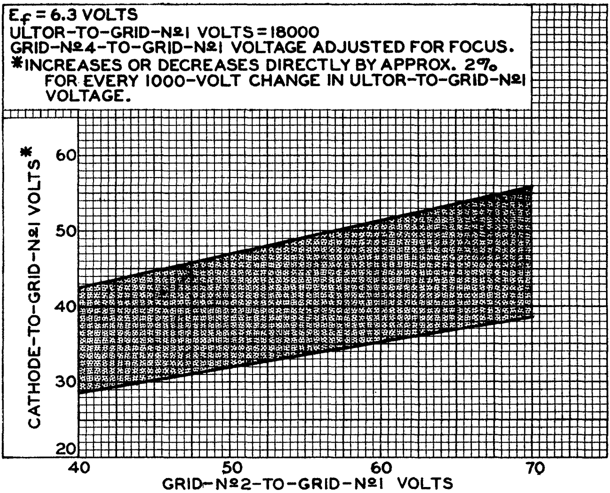
RASTER-CUTOFF-RANGE CHART



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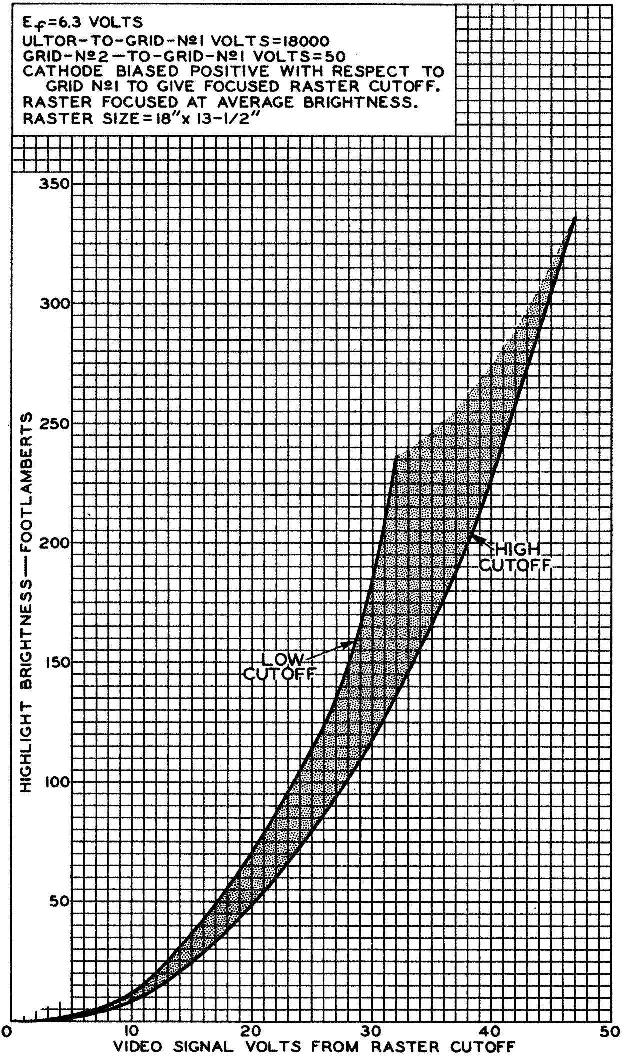
CATHODE-DRIVE CHARACTERISTICS



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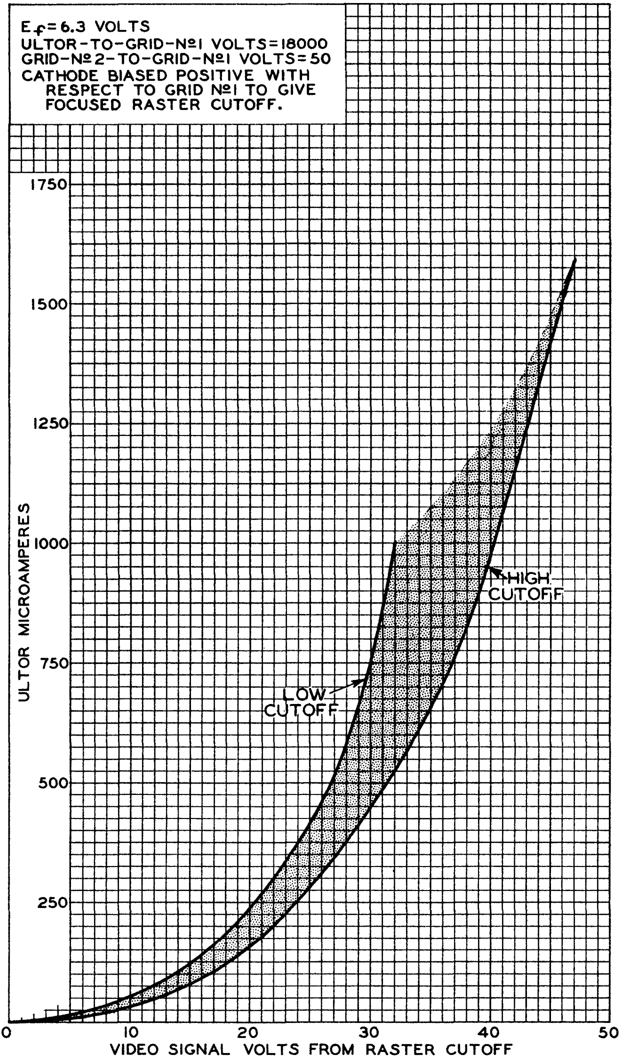
CATHODE-DRIVE CHARACTERISTICS



21EP4B

Picture Tube

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC 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	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

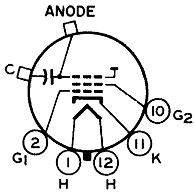
Optical:

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 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.

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

Typical Operating Conditions for Grid-Drive Service:

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

Anode Voltage	12000	volts
Grid-No.2 Voltage	300	volts
Grid-No.1 Voltage for visual extinction of focused raster	−28 to −72	volts

Maximum Circuit Value:

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

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

→ Indicates a change.

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PICTURE TUBE

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

With heater having controlled warm-up time

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

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

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes	6	$\mu\mu f$
Cathode to all other electrodes	5	$\mu\mu f$
External conductive coating to ultor	2500 max.	$\mu\mu f$
	2000 min.	$\mu\mu f$

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 . . . 12-9/16" ± 5/16"
 Greatest width . . . 20-1/4" ± 1/8"
 Greatest height . . . 16-3/8" ± 1/8"
 Diagonal . . . 21-3/8" ± 1/8"
 Neck length . . . 3-9/16" ± 1/8"
Screen Dimensions (Minimum):
 Greatest width . . . 19-1/16"
 Greatest height . . . 15-1/16"
 Diagonal . . . 20-1/4"
 Projected area . . . 262 sq. in.
Weight (Approx.) . . . 23 lbs
Operating Position . . . Any
Cap . . . Recessed Small Cavity (JEDEC No.J1-21)
Bulb . . . J171 H1/J1
Socket . . . Ucinite Part No.115446, or equivalent
Base . . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)

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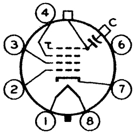
Basing Designation for BOTTOM VIEW. 8JR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.3
Pin 6 - Internal Connection—Do Not Use
Pin 7 - Cathode



Pin 8 - Heater
Cap - Ultor (Grid No.4, Collector)
C - External Conductive Coating

GRID-DRIVE▲ SERVICE

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

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

ULTOR VOLTAGE	18000	max.	volts
	12000♣	min.	volts
GRID-No.3 VOLTAGE	650	max.	volts
GRID-No.2 VOLTAGE	550	max.	volts
	300	min.	volts
GRID-No.1 VOLTAGE:			
Negative-peak value	200	max.	volts
Negative-bias value	140	max.	volts
Positive-bias value	0	max.	volts
Positive-peak value	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds.	410	max.	volts
After equipment warm-up period. . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c_4k}) between 12000 and 18000 volts and grid-No.2 voltage (E_{c_2k}) between 400 and 550 volts

Grid-No.3 Voltage for focus§.	0 to 400	volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster.	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive)	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.3 Current	-25 to +25	μa

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Grid-No.2 Current	-15 to +15		μa
Field Strength of Adjustable Centering Magnet♦. . .	0 to 10		gausses

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*18000*	*volts*
and grid-No.2 voltage of	*400*	*500*	*volts*
Grid-No.3 Voltage for focus	0 to 400	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster.	-34 to -63	-43 to -78	volts
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	34 to 63	43 to 78	volts

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

Maximum and Minimum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE.	18000	max.	volts
	12000⊕	min.	volts
GRID-No.3-TO-GRID-No.1 VOLTAGE.	650	max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	690	max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	550	max.	volts
	300	min.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:			
Positive-peak value	200	max.	volts
Positive-bias value	140	max.	volts
Negative-bias value	0	max.	volts
Negative-peak value	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds.	410	max.	volts
After equipment warm-up period. . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($Ec_{u}g_1$) between 12000 and 18000 volts and grid-No.2-to-grid-No.1 voltage (Ec_2g_1) between 400 and 690 volts

Grid-No.3-to-Grid-No.1 Voltage for focus§.	0 to 400	volts

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Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster.	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*		
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage		
Grid-No.3 Current	-25 to +25		μa
Grid-No.2 Current	-15 to +15		μa
Field Strength of Adjustable Centering Magnet♦. . .	0 to 10		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	*400*	*500*	*volts*
Grid-No.3-to-Grid-No.1 Voltage for focus	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster.	34 to 56	41 to 69	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	-34 to -56	-41 to -69	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. . . . . . . 1.5 max. megohms

▲ Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

✠ This value is a working design-center minimum. The equivalent *absolute minimum* ultor- or ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 21EQP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor- or ultor-to-grid-No.1 voltage is never less than 11,000 volts.

§ The grid-No.3 voltage required for optimum focus of any individual tube may have a value anywhere between 0 and 400 volts and is a function of the value of the ultor voltage, ultor current, and grid-No.2 voltage. It changes directly with the ultor voltage at the rate of approximately 46 volts for each 1000-volt change in ultor voltage; inversely with grid-No.2 voltage at the rate of about 60 volts for each 100-volt change in grid-No.2 voltage; and inversely with ultor current at the rate of about 60 volts for each 100-microampere change in ultor current. Because the 21EQP4 has a narrow depth of focus, it is necessary to provide means such as a potentiometer or a 4-tap switch for adjusting the focusing voltage. In general, commercially acceptable focus is

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obtained if the focusing voltage is within 75 volts of the value required for optimum focus and if the focusing voltage is maintained to within 75 volts of the optimum value during line-voltage fluctuations.

Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

OPERATING CONSIDERATIONS

Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 21EQP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

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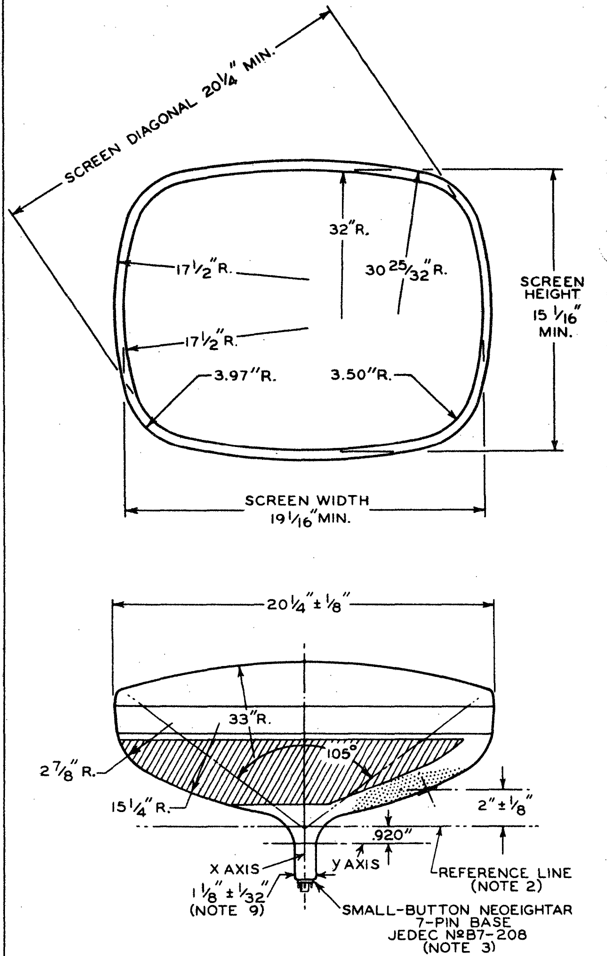
PICTURE TUBE



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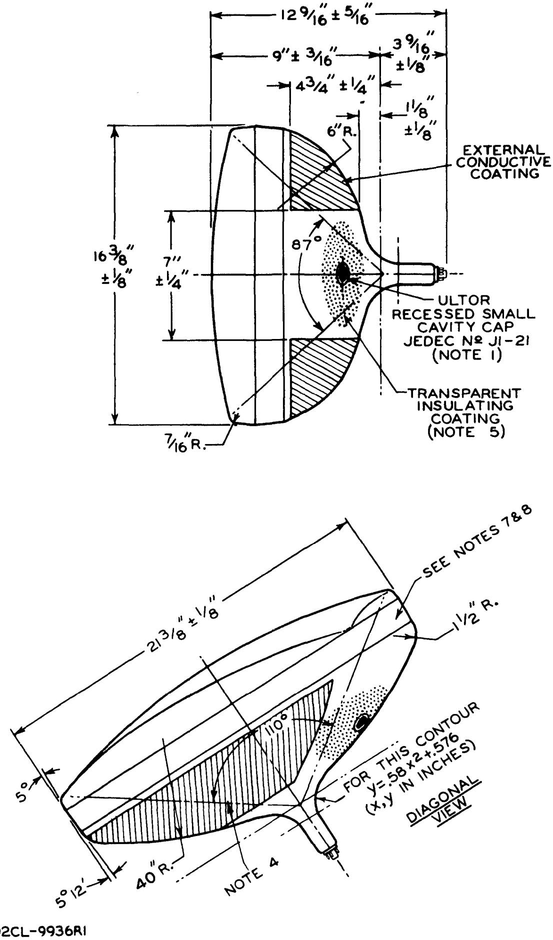
PICTURE TUBE



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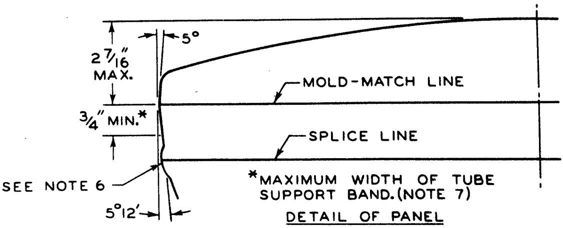
PICTURE TUBE



DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-126 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

NOTE 7: WIDTH OF UNDISTURBED REGION BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

NOTE 8: TUBE MOUNTING OR YOKE SUPPORT CLAMPS MUST BE SPACED FROM TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

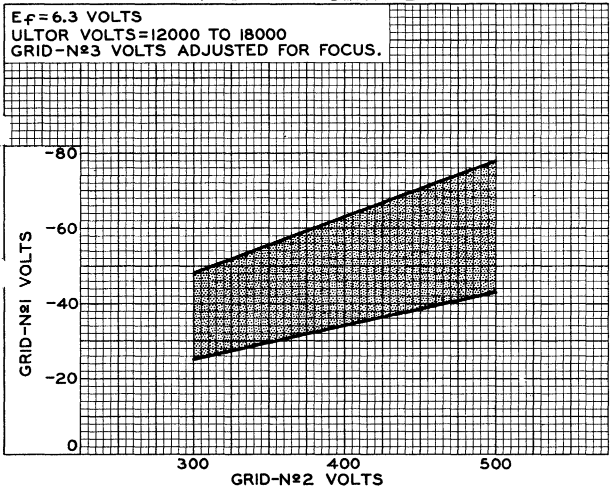
NOTE 9: NECK DIAMETER IS MAINTAINED TO AT LEAST 2-7/16" FROM REFERENCE LINE.

RCA

21EQP4

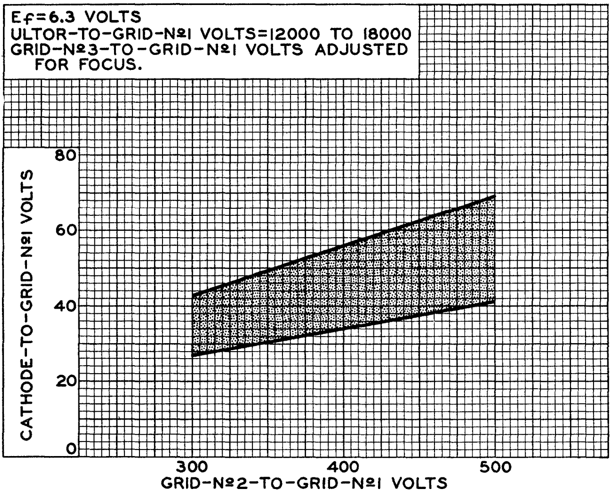
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



92CS-9933

CATHODE-DRIVE SERVICE



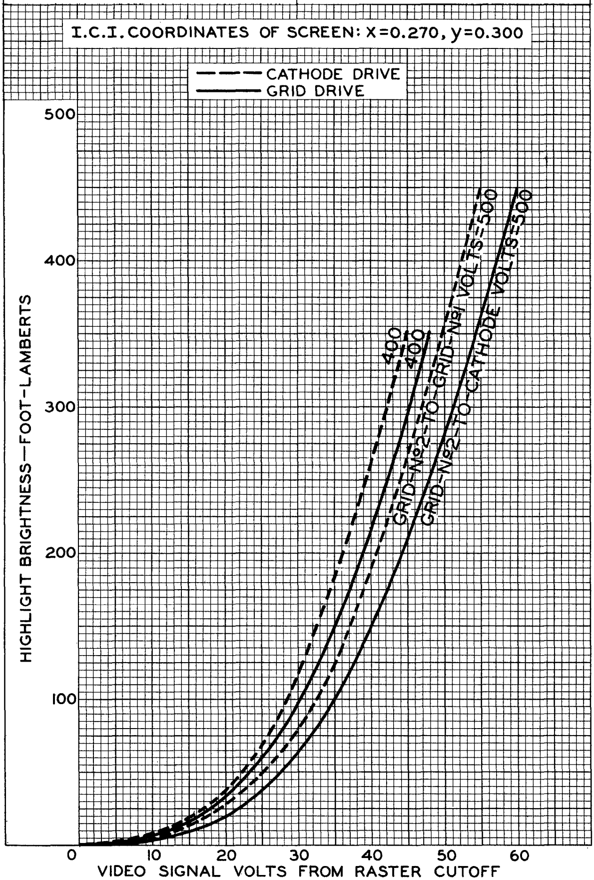
92CS-9934

21EQP4

21EQP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-Nº1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID Nº1 TO GIVE FOCUSED RASTER CUTOFF.	GRID Nº1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 18" x 13½"	RASTER SIZE = 18" x 13½"

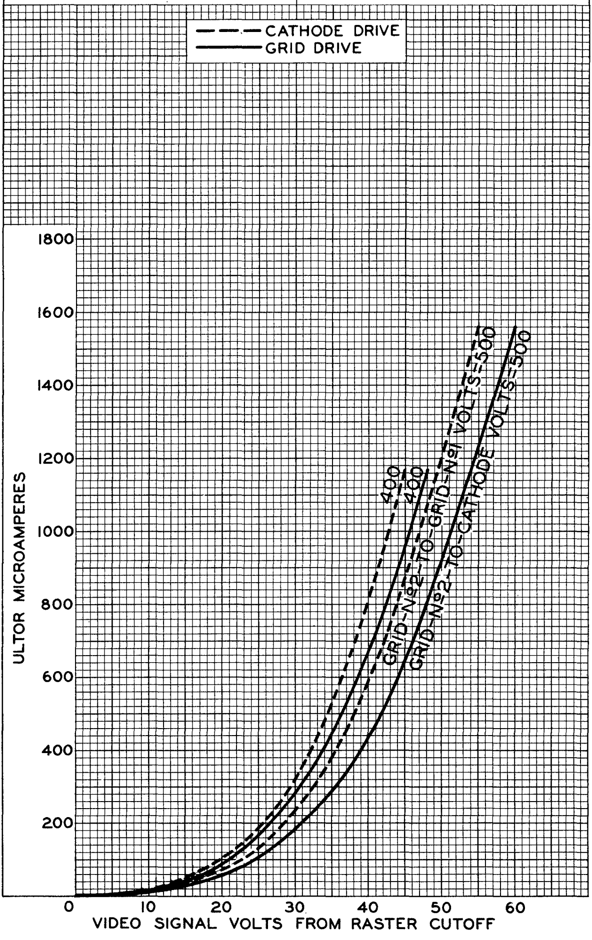


2IEQP4

RCA
2IEQP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS=12000 TO 18000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f = 6.3 VOLTS ULTOR VOLTS=12000 TO 18000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



ELECTRON TUBE DIVISION 92CM-9935

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21EVP4

Picture Tube

SHORT RECTANGULAR GLASS TYPE | **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS | **110° MAGNETIC DEFLECTION**
INTERNAL MAGNETIC SHIELD

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Direct Interelectrode Capacitances:		
Cathode to all other electrodes	3.65	pf
Grid No.1 to all other electrodes . . .	4.15	pf
External conductive coating to anode. .	2000 max.	pf
	1500 min.	pf
Heater Current at 2.68 volts.	450 ± 45	ma
Heater Warm-Up Time (Average)	11	seconds

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

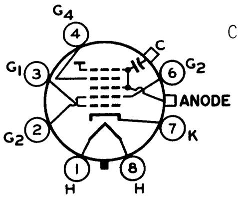
Optical:

Phosphor (For curves, see front of this section) . P4—Sulfide Type, Aluminized
Faceplate, Spherical. . . . . Filterglass
Light transmission (Approx.). 75.5%

Mechanical:

Weight (Approx.). 20 lbs
Overall Length. . . . . 12-15/16" ± 1/4"
Neck Length . . . . 3-11/16" ± 1/16"
Projected Area of Screen. . . . . 262 sq. in.
External Conductive Coating:
Type. . . . . .Regular-Band
Contact area for grounding. . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J171 G/K* sheets at front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)
Basing Designation for BOTTOM VIEW. 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

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

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	$\mu\mu$f
Cathode to all other electrodes	5	$\mu\mu$f
External conductive coating to ultor	2500 max.	$\mu\mu$f
	2000 min.	$\mu\mu$f

Electron Gun . . . . Type Requiring No Ion-Trap Magnet

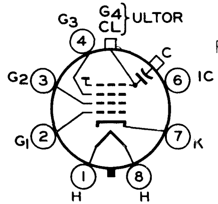
Optical:

Faceplate . . . . Filterglass
Light transmission (Approx.) 76%
Phosphor (For curves, see front of this Section) . . P4—Sulfide Type, Aluminized

Mechanical:

Operating Position . . . . Any
Weight (Approx.) . . . . 20 lbs
Overall Length . . . . 12-13/16" ± 5/16"
Neck Length . . . . 3-9/16" ± 1/8"
Projected Area of Screen . . . . 262 sq. in.
External Conductive Coating:
Type . . . . Modified Band
Contact area for grounding . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines* and *Bulb J171 G/K* sheets at the front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base . . . . .Small-Button Neoeightar 7-Pin, Arrangement 1 (JEDEC No.B7-208)
Basing Designation for BOTTOM VIEW 8JR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.3
Pin 6 - IC — Do Not Use
Pin 7 - Cathode



Pin 8 - Heater
Cap - Ultor (Grid No.4, Collector)
C - External Conductive Coating

21FAP4

Maximum Ratings, *Design-Maximum Values:*

ULTOR VOLTAGE	22000 max.	volts
GRID-No.3 (FOCUSING) VOLTAGE:		
Positive value	700 max.	volts
GRID-No.2 VOLTAGE	600 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	154 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode	200 max.	volts

Typical Operating Conditions:

With ultor voltage of	*16000*	*volts*
and grid-No.2 voltage of	*500*	*volts*
Grid-No.3 Voltage for focus	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster	-43 to -78	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms

For X-radiation shielding considerations, see sheet
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this section

21FDP4

Picture Tube

SHORT RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts.	600 ± 5%	ma
Heater Warm-Up Time (Average).	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes. . .	6	μμf
Cathode to all other electrodes. . . .	5	μμf
External conductive coating to ultor .	2000 max.	μμf
	1500 min.	μμf

Electron Gun . . . . .Type Requiring No Ion-Trap Magnet

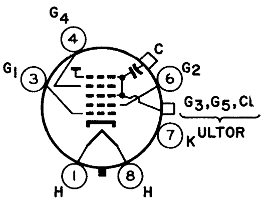
Optical:

Faceplate. . . . . .Filterglass
Light transmission (Approx.) 76%
Phosphor (For curves, see front of this Section) . P4—Sulfide Type, Aluminized

Mechanical:

Operating Position . . . . .Any
Weight (Approx.) . . . . 20 lbs
Overall Length . . . . 13-1/8" ± 1/4"
Neck Length. . . . . 3-7/8" ± 1/16"
Projected Area of Screen . . . . 262 sq. in.
External Conductive Coating:
Type . . . . Regular Band
Contact area for grounding . . . . .Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines* and *Bulb J171 G/K* sheets at the front of this section
Cap. . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . . . Small-Button Neoeightar 7-Pin, Arrangement 1 (JEDEC No.B7-208)
Basing Designation for BOTTOM VIEW 8KW

Pin 1 - Heater
Pin 3 - Grid No.1
Pin 4 - Grid No.4
Pin 6 - Grid No.2
Pin 7 - Cathode
Pin 8 - Heater
Cap - Ultor (Grid No.3, Grid No.5, Collector)
C - External Conductive Coating



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 — **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. . . . 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%

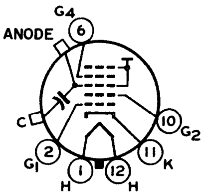
Mechanical:

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

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 ± 10% . . . . amp

Faceplate, Spherical . . . . Frosted Filterglass

Phosphor (For Curves, see front of this Section) . P4—Sulfide Type

Deflection Angles (Approx.):
- Diagonal . . . . 70°
- Horizontal . . . . 66°
- Vertical . . . . 50°

Electron Gun . . . . Ion-Trap Type Requiring External Single-Field Magnet

Tube Dimensions:
- Maximum overall length . . . . 22-5/8"
- Greatest width at lip . . . . 19-23/32" ± 1/8"
- Greatest height at lip . . . . 15-5/16" ± 1/8"
- Diagonal at lip . . . . 20-3/4" ± 1/4"
- Neck length . . . . 7-1/2" ± 3/16"
- Radius of curvature of faceplate (External surface) . . 33"

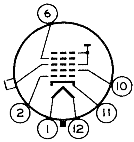
Screen Dimensions (Minimum):
- Greatest width . . . . 18-1/8"
- Greatest height . . . . 13-11/16"
- Diagonal . . . . 19-1/8"

Operating Position . . . . Any

Ultor Terminal . . . . Metal-Shell Lip

Base . . Small-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-63)
- Basing Designation for BOTTOM VIEW 12M

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Grid No.4
Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater



Metal-Shell Lip - Ultor (Grid No.3, Grid No.5, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

← Indicates a change.

21MP4

PICTURE TUBE

PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period . . .	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms

For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

Picture Tube

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC 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. .	{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

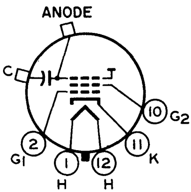
Optical:

Phosphor (For curves, see front of this section) . P4—Sulfide Type, Aluminized
Faceplate, Spherical. . . . . Filterglass
Light transmission (Approx.). 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.

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

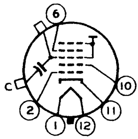
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Capacitance between External Conductive Coating and Ultor	2500 max. / 2000 min.	μμf / μμf
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" ± 3/8"
Greatest width		18-11/16" ± 1/8"
Greatest height		14-15/16" ± 1/8"
Diagonal		20-5/8" ± 3/16"
Neck length		7-1/2" ± 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

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

21XP4-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 — **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. .	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

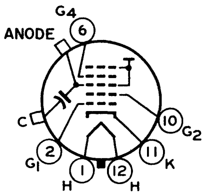
Optical:

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.

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 — ALUMINIZED SCREEN
MAGNETIC 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. .	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

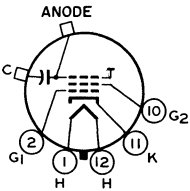
Optical:

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.

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 — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 92° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 5%	ma
Heater Warm-Up Time (Average)	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes . . .	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor. .	2500 max.	μμf
	2000 min.	μμf

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

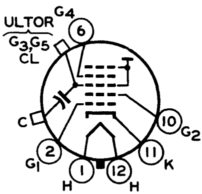
Optical:

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.). . . . . 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 *Picture-Tube Dimensional-Outlines* and *Bulb J187 D/G* sheets at the front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . .Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)
Basing Designation for BOTTOM VIEW. 12L

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Grid No.4
Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater



Cap - Ultor (Grid No.3, Grid No.5, Collector)
C - External Conductive Coating

Maximum and Minimum Ratings, *Design-Maximum Values:*

ULTOR VOLTAGE	25000 max.	volts
	12000 min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	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

23ALP4

Picture Tube

SHORT RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 114° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

The 23ALP4 is the same as the 23MP4 except for the following item:

Electrical:

Heater Current at 6.3 volts. . . . . 450 ± 20 ma

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 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 — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 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

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 μμf
  Cathode to all other electrodes . . . 5 μμf
  External conductive coating to ultor . { 2500 max. μμf / 1700 min. μμf
Electron Gun . . . . Type Requiring No Ion-Trap Magnet

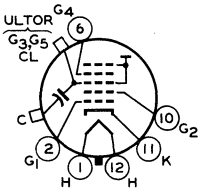
Optical:

Faceplate . . . . Filterglass
  Light transmission (Approx.) 78%
Phosphor (For curves, see front of this Section) . P4—Sulfide Type, Aluminized

Mechanical:

Operating Position . . . . Any
Weight (Approx.) . . . . 25 lbs
Overall Length . . . . 18-1/8" ± 3/8"
Neck Length . . . . 5-5/8" ± 3/16"
Projected Area of Screen . . . . 282 sq. in.
External Conductive Coating:
  Type . . . . Regular Band
  Contact area for grounding . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
  See *Picture-Tube Dimensional-Outlines* and *Bulb J187 C/F* sheets at the front of this section
Cap . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . . . Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)
  Basing Designation for BOTTOM VIEW 12L

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Grid No.4
Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater



Cap - Ultor (Grid No.3, Grid No.5, Collector)
C - External Conductive Coating

23BJP4

Maximum and Minimum Ratings, *Design-Maximum Values:*

ULTOR-TO-GRID-No.1 VOLTAGE.	25000 max.	volts
	11000 min.	volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:		
Positive value.	1250 max.	volts
Negative value.	450 max.	volts
GRID-No.2 TO-GRID-No.1 VOLTAGE.	225 max.	volts
	40 min.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	70 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive peak value	220 max.	volts
Positive bias value	154 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
HEATER VOLTAGE.	6.9 max.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	450 max.	volts
After equipment warm-up period. . . .	200 max.	volts
Heater positive with respect to cathode.	200 max.	volts

Typical Operating Conditions:

With ultor-to-grid No.1 voltage of	*20000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*50*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus.	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster.	36 to 54	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1.5 max.	megohms

For X-radiation shielding considerations, see sheet
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this section

23BKP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE | **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS | **92° MAGNETIC DEFLECTION**
LOW GRID-No.2 VOLTAGE | **CATHODE-DRIVE TYPE**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes . . .	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor. .	2500 max.	μμf
	1700 min.	μμf

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

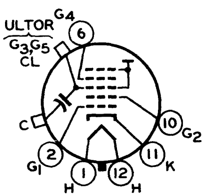
Optical:

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.). 35 lbs
Overall Length. . . . . 18-7/16" ± 7/16"
Neck Length . . . . 5-5/8" ± 3/16"
Projected Area of Screen. . . . . 282 sq. in.
External Conductive Coating:
Type. . . . . .Regular Band
Contact area for grounding. . . . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines* and *Bulb J187 D/G* sheets at the front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . .Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)
Basing Designation for BOTTOM VIEW. 12L

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Grid No.4
Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater



Cap - Ultor (Grid No.3 Grid No.5, Collector)
C - External Conductive Coating

23BKP4

Maximum and Minimum Ratings, *Design-Maximum Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	25000	max.	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
GRID-No.2-TO-CATHODE VOLTAGE	70	max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:			
Positive peak value	220	max.	volts
Positive bias value	154	max.	volts
Negative bias value	0	max.	volts
Negative peak value	2	max.	volts
HEATER VOLTAGE	6.9	max.	volts
	5.7	min.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds	450	max.	volts
After equipment warm-up period	200	max.	volts
Heater positive with respect to cathode	200	max.	volts

Typical Operating Conditions:

With ultor-to-grid-No.1 voltage of	*20000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*50*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	36 to 54	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms

For X-radiation shielding considerations, see sheet *X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES* at front of this section

23BLP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE	ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS	92° MAGNETIC DEFLECTION
LOW-GRID-No.2 VOLTAGE	CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

The 23BLP4 is the same as the 23BKP4 except for the following item:

Optical:

Surface of Protective Panel. . . . . .Treated to reduce specular reflection

23BQP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts.	450 ± 5%	ma
Heater Warm-Up Time (Average).	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes. . .	6	μμf
Cathode to all other electrodes. . . .	5	μμf
External conductive coating to ultor .	2500 max.	μμf
	2000 min.	μμf

Electron Gun . . . . .Type Requiring No Ion-Trap Magnet

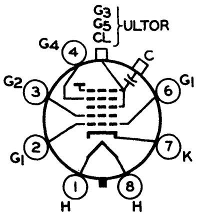
Optical:

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 *Picture-Tube Dimensional-Outlines* and *Bulb J187A* 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 — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 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

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — 110° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

The 23CBP4 is the same as the 23UP4 except for the following items:

Optical:

Surface of Protective Panel . . . . Treated to reduce specular reflection

Maximum and Minimum Ratings, *Design-Maximum Values:*

ULTOR VOLTAGE	23000 max.	volts
	12000 min.	volts

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.6 ± 5%	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	$\mu\mu f$
Cathode to all other electrodes	5	$\mu\mu f$
External conductive coating to ultor	2500 max.	$\mu\mu f$
	2000 min.	$\mu\mu f$

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):

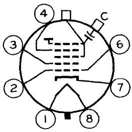
	Radius at center	*Radius at edge*
In plane of diagonal deflection	39-1/2"	31-1/2"
In plane of horizontal deflection	39-3/4"	26-1/2"

	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 any ultor voltage (E_{c_5k}) between 12000● and 20000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus★.	0 to 400	volts

Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak positive).	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current.	-25 to +25	μa
Grid-No.2 Current.	-15 to +15	μa
Field Strength of Adjustable Centering Magnet♦	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*18000*	*volts*
and grid-No.2 voltage of	*400*	*volts*
Grid-No.4 Voltage for focus★	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster	-44 to -94	volts
Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value.	44 to 94	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms

CATHODE-DRIVE♣ SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No.1

Maximum and Minimum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	20000	max.	volts
	12000●	min.	volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:			
Positive value	1000	max.	volts
Negative value	500	max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	640	max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500	max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:			
Positive-peak value.	200	max.	volts
Positive-bias value.	140	max.	volts
Negative-bias value.	0	max.	volts
Negative-peak value.	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds	410	max.	volts

After equipment warm-up period.	180	max.	volts
Heater positive with respect to cathode. .	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5 g_1}$) between 12000● and 20000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2 g_1}$) between 225 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for focus★.	0 to 400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster.	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet♦	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus★.	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster.	42 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	-42 to -78	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1.5 max.	megohms

▲ Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

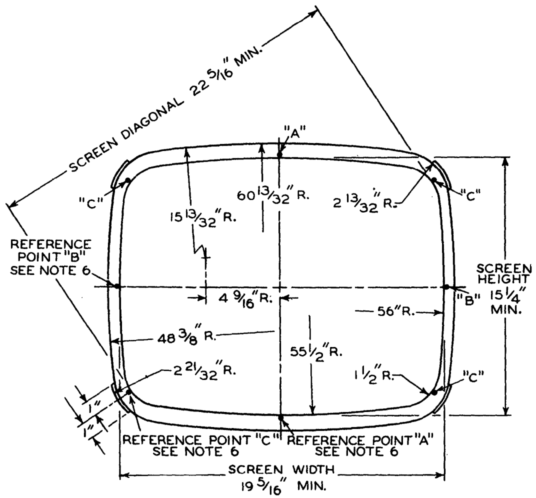
● This value is a working design-center minimum. The equivalent *absolute minimum* ultor (or ultor-to-grid-No.1) voltage is 11,000 volts below which the serviceability of the 23CP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor (or ultor-to-grid-No.1) voltage is never less than 11,000 volts.

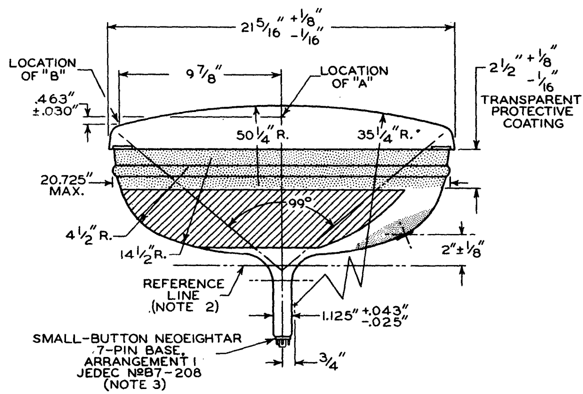
★ The grid-No.4 (or grid-No.4-to-grid-No.1) voltage required for optimum focus of any individual tube may have a value anywhere between 0 and 400 volts; is independent of ultor current; and will remain essentially constant for values of ultor (or ultor-to-grid-No.1) voltage, or grid-No.2 (or grid-No.2-to-grid-No.1) voltage, within design ranges shown for these items.

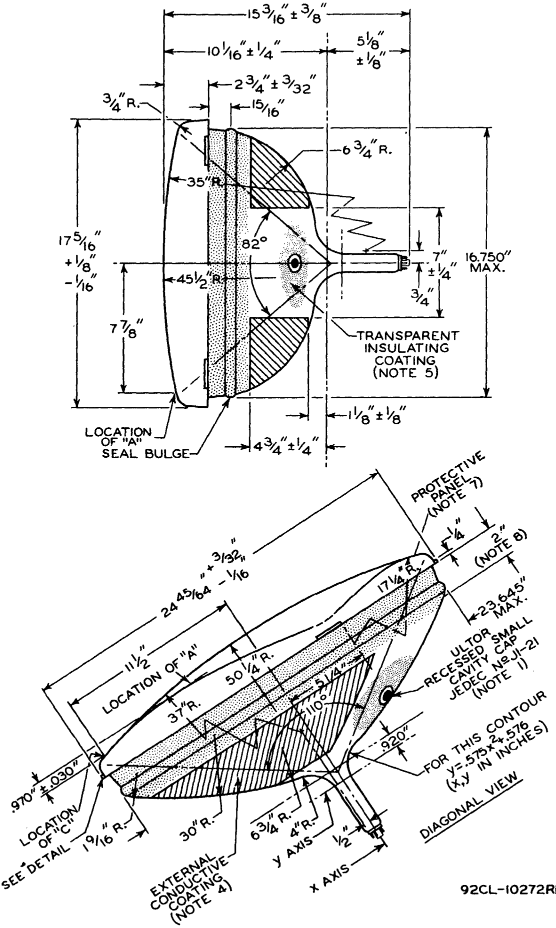
♦ Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section


SCREEN DIAGONAL 22 5/16" MIN.
"A"
"C"
60 13/32" R.
2 13/32" R.
15 13/32" R.
REFERENCE POINT "B" SEE NOTE 6
SCREEN HEIGHT 15 1/4" MIN.
"B"
4 9/16" R.
56" R.
48 3/8" R.
55 1/2" R.
2 21/32" R.
1 1/2" R.
1"
1"
REFERENCE POINT "C" SEE NOTE 6
REFERENCE POINT "A" SEE NOTE 6
SCREEN WIDTH 19 5/16" MIN.


21 5/16" +1/8" -1/16"
LOCATION OF "B"
9 7/8"
LOCATION OF "A"
2 1/2" +1/8" -1/16"
TRANSPARENT PROTECTIVE COATING
.463" ±.030"
50 1/4" R.
35 1/4" R.
20.725" MAX.
99°
4 1/2" R.
14 1/2" R.
2" ± 1/8"
REFERENCE LINE (NOTE 2)
1.125" +.043" -.025"
SMALL-BUTTON NEOEIGHTAR 7-PIN BASE, ARRANGEMENT I JEDEC №B7-208 (NOTE 3)
3/4"



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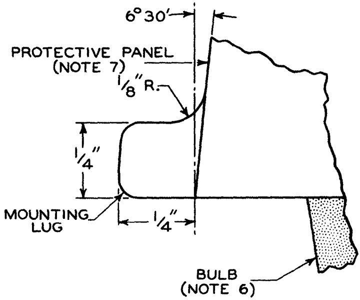
DETAIL OF MOUNTING LUG



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-126 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS OF THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: REFERENCE POINTS A, B, AND C ARE PROVIDED FOR USE IN DESIGN OF A MASK CONTOURED FOR CLOSE FIT TO THE PROTECTIVE PANEL.

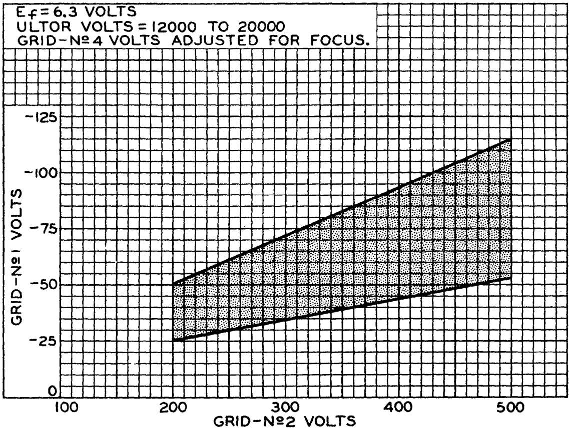
NOTE 7: THE CENTER OF THE PROTECTIVE PANEL MAY BE ECCENTRIC WITH RESPECT TO THE AXIS OF THE TUBE ENVELOPE. ASSOCIATED SHIFT OF THE PROTECTIVE PANEL ALONG ITS MINOR AND/OR MAJOR AXIS WILL NOT EXCEED 1/16".

NOTE 8: KEEP THIS CIRCUMFERENTIAL AREA FREE OF MOUNTING HARDWARE.

NOTE 9: ADEQUATE TUBE SUPPORT IS OBTAINED BY CLAMPING TO THE MOUNTING LUGS PROVIDED AT EACH CORNER OF THE PROTECTIVE PANEL. TUBE MOUNTING AND YOKE SUPPORT CLAMPS MUST BE SPACED FROM THE TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

RASTER-CUTOFF-RANGE CHARTS

Grid-Drive Service



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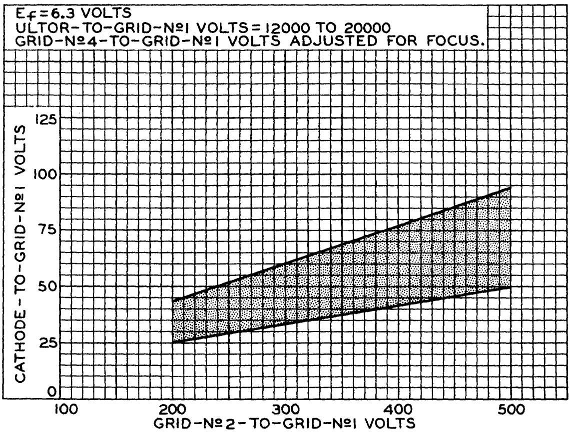
Cathode-Drive Service



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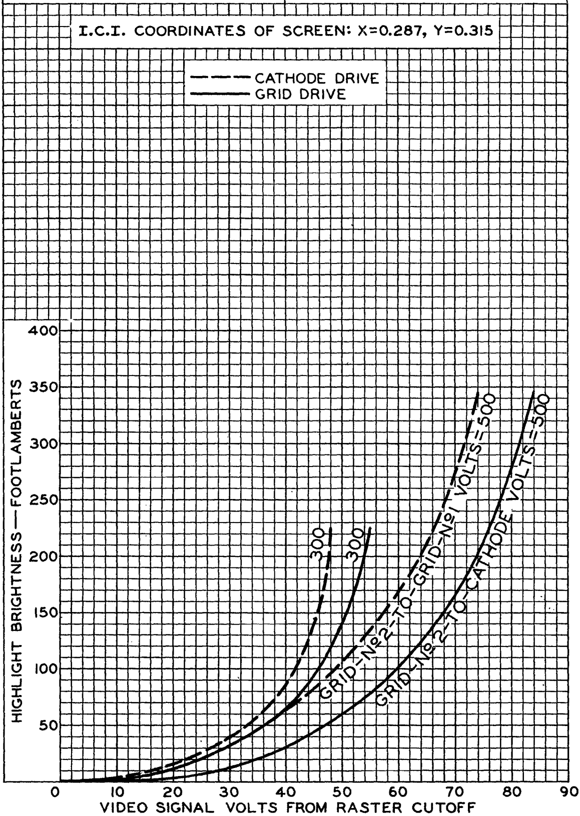
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 18" x 13½"	RASTER SIZE = 18" x 13½"



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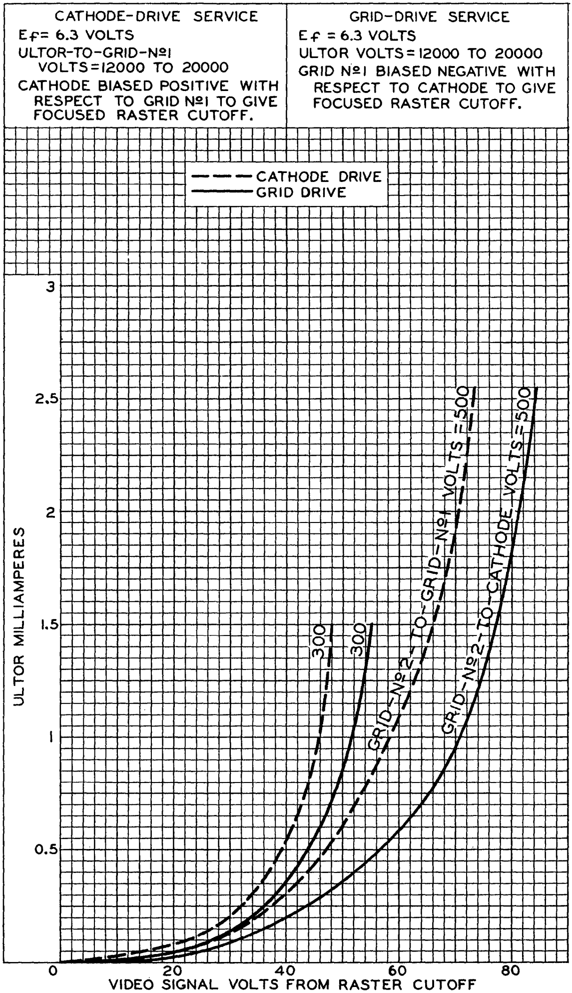
AVERAGE DRIVE CHARACTERISTICS



92CM-10317

23CP4A

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Direct Interelectrode Capacitances:		
Cathode to all other electrodes	5	pf
Grid No.1 to all other electrodes . . .	6	pf
External conductive coating to anode. .	2500 max.	pf
	2000 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

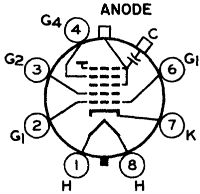
Optical:

Phosphor (For curves, see front of this Section) . P4—Sulfide Type, Aluminized
Faceplate and Protective Panel. . . . . Filterglass
Light transmission (Approx.). 40%

Mechanical:

Weight (Approx.). . . . . 33 lbs
Overall Length. 15-3/16" ± 3/8"
Neck Length . . . . 5-1/8" ± 1/8"
Projected Area of Screen. . . . . 282 sq. in.
External Conductive Coating:
Type. . . . . .Regular-Band
Contact area for grounding. . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J187 A* sheets at front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)
Basing Designation for BOTTOM VIEW. 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



Cap - Anode (Grid No.3, Grid No.5, Screen, Collector)
C - External Conductive Coating

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	**ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS	**MAGNETIC DEFLECTION**
LOW GRID-No.2 VOLTAGE	**CATHODE-DRIVE TYPE**

With Heater Having Controlled Warm-Up Time

DATA

General:

Heater, for Unipotential Cathode:
- Voltage (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 $\mu\mu$f
- Cathode to all other electrodes. . . . . 5 $\mu\mu$f
- External conductive coating to ultor . . {2500 max. $\mu\mu$f; 1700 min. $\mu\mu$f}

Faceplate 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"

	Radius at center	Radius at edge
In plane of horizontal deflection . . .	39-3/4"	26-1/2"
In plane of vertical deflection.	36-3/4"	18-1/2"

Screen Dimensions (Minimum):
- Greatest width. . . . . 19-5/16"
- Greatest height . . . . 15-1/4"
- Diagonal. . . . . 22-5/16"
- Projected area. . . . . 282 sq. in.

Weight (Approx.). . . . . 33 lbs

Operating Position. . . . . Any

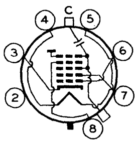
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)

Bulb. . . . . J187 Fitted with Protective Panel FP198

Base. . . . . . Small-Button Neoeightar 7-Pin Arrangement 2, (JEDEC No.B7-219)

Basing Designation for BOTTOM VIEW. 8KP

Pin 2 - Internal Connection—Do Not Use
Pin 3 - Cathode
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid No.1
Pin 7 - Grid No.2



Pin 8 - Grid No.4
Cap - Ultor (Grid No.3, Grid No.5, Collector)
C - External Conductive Coating

CATHODE-DRIVE▲ SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No.1

Maximum and Minimum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE.	20000	max.	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 (Ec_5g_1) between 12000● and 20000 volts and grid-No. 2-to-grid No. 1 voltage (Ec_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 (Ek_{g1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart*	
Cathode-to-Grid-No. 1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for Ek_{g1} except video drive is a negative voltage	
Grid-No. 4 Current	−25 to +25	μa
Grid-No. 2 Current	−15 to +15	μa
Field Strength of Adjustable Centering Magnet♦	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No. 1 voltage of	*16000*	*18000*	*volts*
and grid-No. 2-to-grid-No. 1 voltage of	*50*	*50*	*volts*
Grid-No. 4-to-Grid-No. 1 Voltage for focus★	0 to 400	0 to 400	volts
Cathode-to-Grid-No. 1 Voltage for visual extinction of focused raster	32 to 47	34 to 49	volts
Cathode-to-Grid-No. 1 Video Drive from Raster Cutoff (Black level): White-level value	−32 to −47	−34 to −49	volts

Maximum Circuit Values:

Grid-No. 1-Circuit Resistance	1.5 max.	megohms

▲ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No. 1 and the other electrodes.

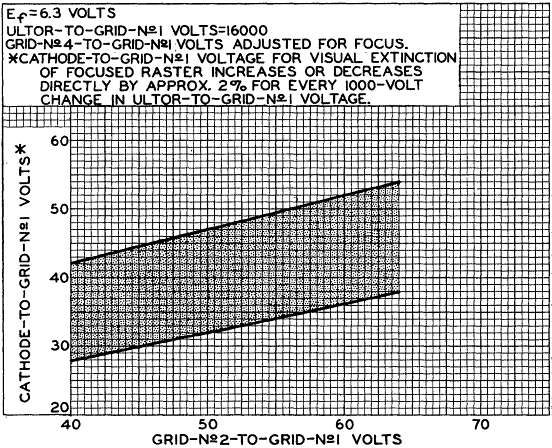
● This value is a working design-center minimum. The equivalent *absolute minimum* ultor-to-grid-No. 1 voltage is 11,000 volts below which the serviceability of the 23EP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor-to-grid-No. 1 voltage is never less than 11,000 volts.

★ The grid-No. 4-to-grid-No. 1 voltage required for focus of any individual tube may have a value anywhere between 0 and 400 volts.

♦ Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

RASTER-CUTOFF-RANGE CHART
Cathode-Drive Service



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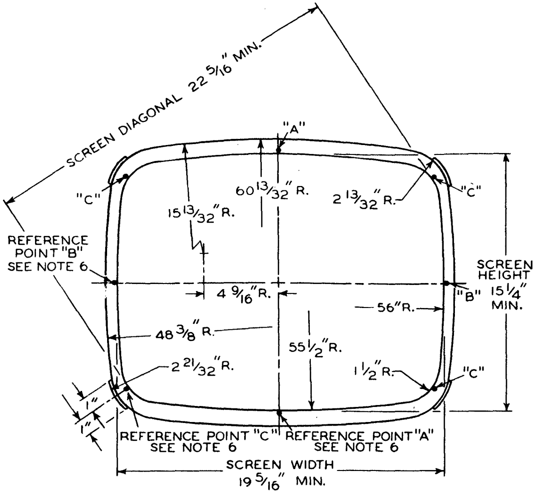
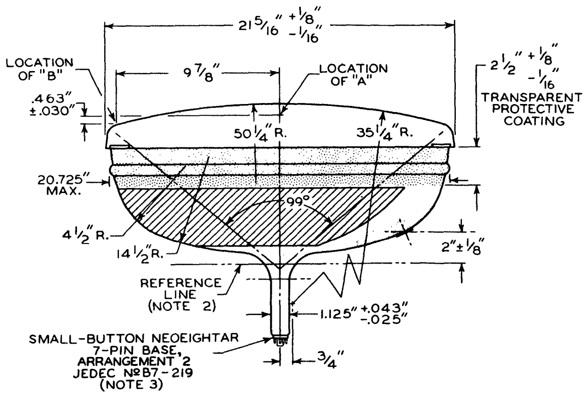
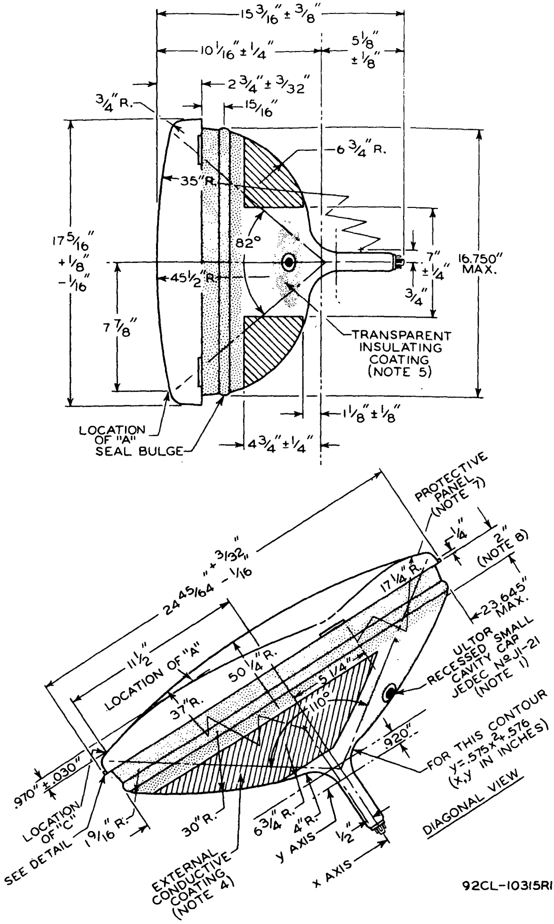
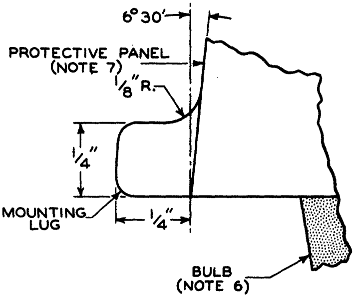

SCREEN DIAGONAL 22 5/16" MIN.
"A"
"C"
60 13/32" R.
2 13/32" R.
"C"
15 13/32" R.
REFERENCE POINT "B" SEE NOTE 6
SCREEN HEIGHT 15 1/4" MIN.
4 9/16" R.
"B"
56" R.
48 3/8" R.
55 1/2" R.
2 21/32" R.
1 1/2" R.
"C"
1"
1"
REFERENCE POINT "C" SEE NOTE 6
REFERENCE POINT "A" SEE NOTE 6
SCREEN WIDTH 19 5/16" MIN.


21 5/16" +1/8" -1/16"
LOCATION OF "B"
9 7/8"
LOCATION OF "A"
2 1/2" +1/8" -1/16"
TRANSPARENT PROTECTIVE COATING
.463" ±.030"
50 1/4" R.
35 1/4" R.
20.725" MAX.
99°
4 1/2" R.
2"±1/8"
14 1/2" R.
REFERENCE LINE (NOTE 2)
1.125" +.043" -.025"
SMALL-BUTTON NEOEIGHTAR 7-PIN BASE, ARRANGEMENT 2 JEDEC No B7-219 (NOTE 3)
3/4"



92CL-10315R1

DETAIL OF MOUNTING LUG



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 8 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 8.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-126 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS OF THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

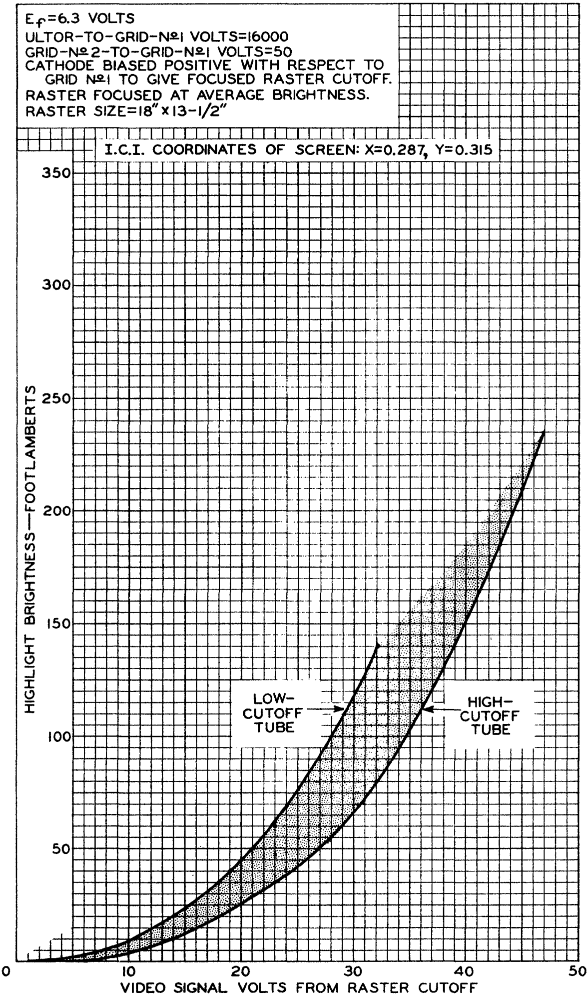
NOTE 6: REFERENCE POINTS A, B, AND C ARE PROVIDED FOR USE IN DESIGN OF A MASK CONTOURED FOR CLOSE FIT TO THE PROTECTIVE PANEL.

NOTE 7: THE CENTER OF THE PROTECTIVE PANEL MAY BE ECCENTRIC WITH RESPECT TO THE AXIS OF THE TUBE ENVELOPE. ASSOCIATED SHIFT OF THE PROTECTIVE PANEL ALONG ITS MINOR AND/OR MAJOR AXIS WILL NOT EXCEED 1/16".

NOTE 8: KEEP THIS CIRCUMFERENTIAL AREA FREE OF MOUNTING HARDWARE.

NOTE 9: ADEQUATE TUBE SUPPORT IS OBTAINED BY CLAMPING TO THE MOUNTING LUGS PROVIDED AT EACH CORNER OF THE PROTECTIVE PANEL. TUBE MOUNTING AND YOKE SUPPORT CLAMPS MUST BE SPACED FROM THE TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

CATHODE-DRIVE CHARACTERISTICS



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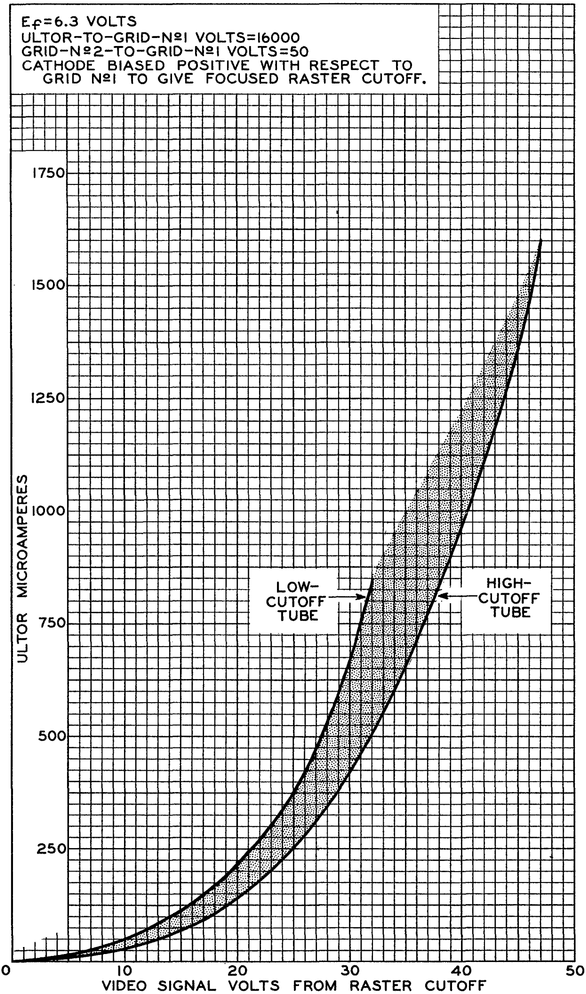
CATHODE-DRIVE CHARACTERISTICS



92CM-9946R1

Picture Tube

SHORT RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **114° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Direct Interelectrode Capacitances:

Cathode to all other electrodes	5	pf
Grid No.1 to all other electrodes . . .	6	pf
External conductive coating to anode. .	2500 max.	pf
	1700 min.	pf
Heater Current at 6.3 volts	600 ± 60	ma
Heater Warm-Up Time (Average)	11	seconds

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

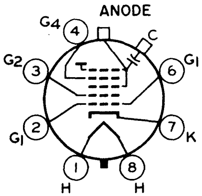
Optical:

Phosphor (For curves, see front of this Section). P4—Sulfide Type, Aluminized
Faceplate . . . . Filterglass
Light transmission (Approx.). 78%

Mechanical:

Weight (Approx.). . . . . 24 lbs
Overall Length. . . . . 13-11/16" + 5/16" − 1/4"
Neck Length . . . . 4-3/8" ± 1/8"
Projected Area of Screen. . . . . 282 sq. in.
External Conductive Coating:
Type. . . . . .Regular-Band
Contact area for grounding. . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines and Bulb J187 B* sheets at front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)
Basing Designation for BOTTOM VIEW. 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



Cap - Anode (Grid No.3, Grid No.5, Screen, Collector)
C - External Conductive Coating

23FP4A

Maximum and Minimum Ratings, *Design-Maximum Values:*

Unless otherwise specified, voltage values are positive with respect to cathode

ANODE VOLTAGE	23500 max. / 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	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. / 5.7 min.	volts / volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode:		
Combined AC and DC voltage	200 max.	volts
DC component	100 max.	volts

Typical Operating Conditions for Grid-Drive Service:

Unless otherwise specified, voltage values are positive with respect to cathode

Anode Voltage	14000	volts
Grid-No.4 Voltage	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	ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS	110° MAGNETIC DEFLECTION
LOW-GRID-NO.2 VOLTAGE	CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Direct Interelectrode Capacitances:

Cathode to all other electrodes	5	pf
Grid No.1 to all other electrodes . . .	6	pf
External conductive coating to anode. .	{2500 max.	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:

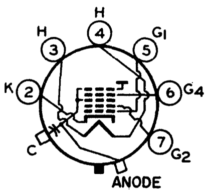
See *Picture-Tube Dimensional-Outlines and Bulb J187 A* sheets at front of this section

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

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	70 max.	volts
	44 min.	volts
CATHODE VOLTAGE:		
Negative peak value	2 max.	volts
Negative bias value	0 max.	volts
Positive bias value	100 max.	volts
Positive peak value	150 max.	volts
HEATER VOLTAGE	6.9 max.	volts
	5.7 min.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	volts
Heater positive with respect to cathode:		
Combined AC 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 — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 30	ma
Heater Warm-Up Time (Average)	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	2500 max.	μμf
	1700 min.	μμf

Focusing Method .Electrostatic
Deflection Method. Magnetic
Deflection Angles (Approx.):
Diagonal . . . . 114°
Horizontal . . . . 102°
Vertical . . . . 84°
Electron Gun . . . . .Type Requiring No Ion-Trap Magnet

Optical:

Faceplate. . . . . .Filterglass
Light transmission at center (Approx.) 78%
Phosphor (For curves, see front of this Section) . P4—Sulfide Type Aluminized
Fluorescence . . . . .White
Phosphorescence. .White
Persistence. Medium Short

Mechanical:

Tube Dimensions:
Overall length . . . . 14-3/8" ± 5/16"
Greatest width . . . . 20-1/2" + 1/16" - 1/8"
Greatest height. . . . . 16-1/2" ± 1/8"
Diagonal . . . . 23-25/64" + 3/32" - 1/8"
Neck length. . . . . 5-1/8" ± 1/8"
Curvature of faceplate (Radii):

	Center	*Intermediate*	*Edge*
External surface	50"	-	36-3/4"
Internal surface	30"	48"	24"

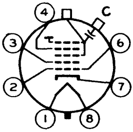
Screen Dimensions (Minimum):
Greatest width . . . . 19-1/4"
Greatest height. 15-1/8"
Diagonal . . . . 22-5/16"
Projected area . . . . .282 sq. in.
Weight (Approx.) . . . . 24 lbs
Operating Position . . . . Any
Cap. . . . . Recessed Small Cavity (JEDEC No.J1-21)
Bulb . . . . J187 (114°)

23MP4

Base. . . . . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)

Basing Designation for BOTTOM VIEW. 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



Cap - Ultor (Grid No.3, Grid No.5, Collector)
C - External Conductive Coating

GRID-DRIVE▲ SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum and Minimum Ratings, *Design-Maximum Values:*

ULTOR VOLTAGE	22000 max. / 11000 min.	volts / volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value.	1100 max.	volts
Negative value.	550 max.	volts
GRID-No.2 VOLTAGE	550 max. / 200 min.	volts / volts
GRID-No.1 VOLTAGE:		
Negative-peak value	220 max.	volts
Negative-bias value	154 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts
HEATER VOLTAGE.	6.9 max. / 5.7 min.	volts / volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	450 max.	volts
After equipment warm-up period. . .	200 max.	volts
Heater positive with respect to cathode.	200 max.	volts

Equipment Design Ranges:

With any ultor voltage (Ec_5k) between 11000 and 22000 volts and grid-No.2 voltage (Ec_2k) between 220 and 550 volts

Grid-No.4 Voltage for focus•.	0 to 400	volts
Grid-No.1 Voltage (Ec_1k) for visual extinction of focused raster	See *Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black level): White level value (Peak positive)	Same value as determined for Ec_1k except video drive is a positive voltage	

Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet★	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*18000*	*volts*
and grid-No.2 voltage of	*400*	*volts*
Grid-No.4 Voltage for focus●	0 to 400	volts
Grid-No.1 Voltage for visual extinction of focused raster	-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.	volts
	11000 max.	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

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) between 11000 and 22000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 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_{kg_1}) for visual extinction of focused raster	See *Raster-Cutoff-Range Chart for Cathode-Drive Service*	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	Same value as determined for E_{kg_1} except video drive is a negative voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet★	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus●	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	36 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	-36 to -78	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms

▲ Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

● Individual tubes will have satisfactory focus at some value of grid-No.4 (or grid-No.4-to-grid-No.1) voltage between 0 and 400 volts under conditions with the combined bias voltage and video-signal voltage adjusted to produce an ultor current of 200 microamperes.

★ Distance from *Reference-Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the the center of the tube face.

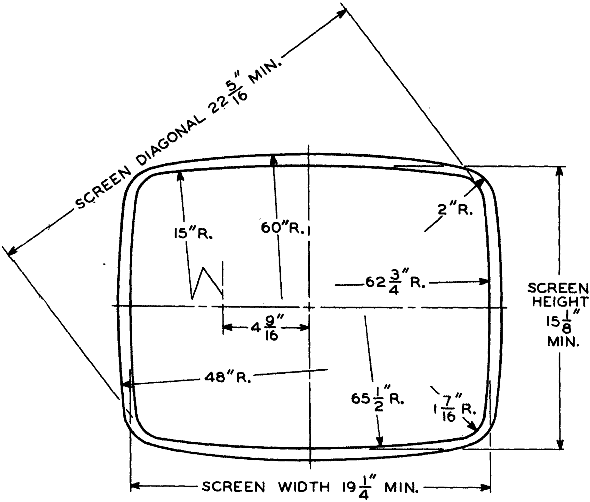
⧫ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

OPERATING CONSIDERATIONS

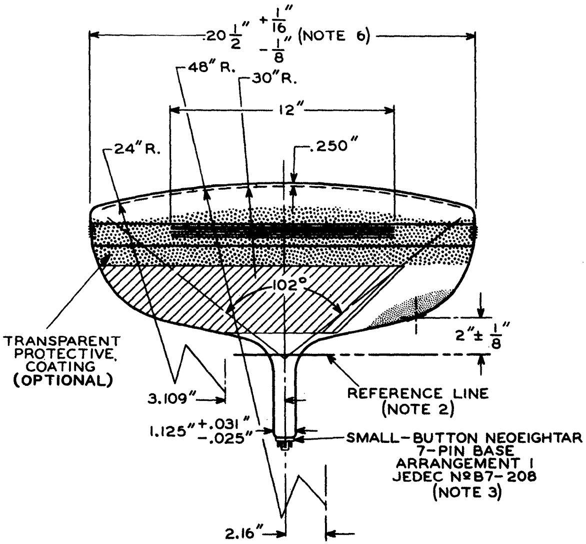
X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, this picture tube does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 22 kilovolts (Design-maximum value), shielding of this picture tube for X-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatterproof, glass cover over the face of this picture tube to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

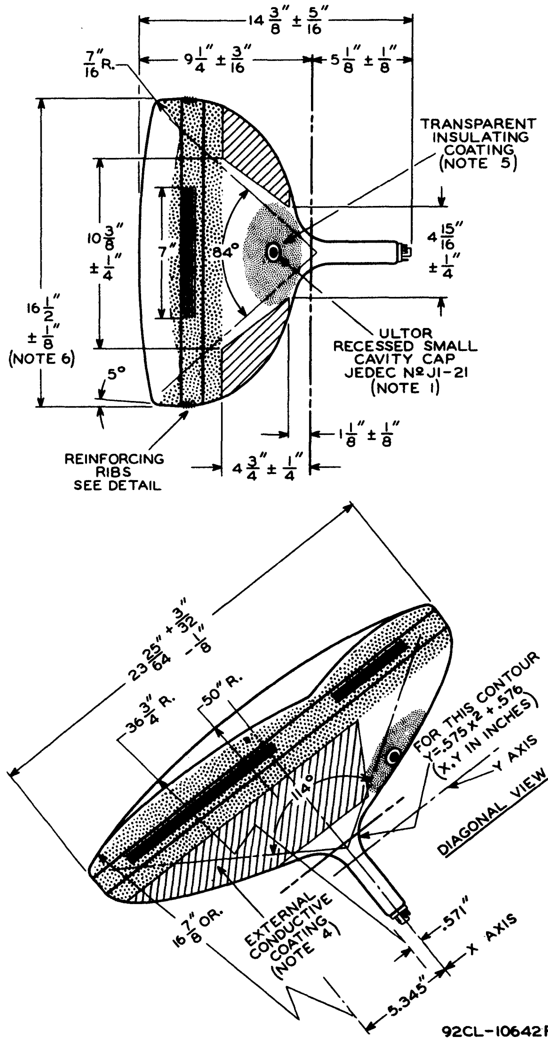
23MP4



SCREEN DIAGONAL 22 5/16" MIN.
15" R.
60" R.
2" R.
62 3/4" R.
4 9/16"
48" R.
65 1/2" R.
1 7/16" R.
SCREEN HEIGHT 15 1/8" MIN.
SCREEN WIDTH 19 1/4" MIN.



20 1/2" +1/16" -1/8" (NOTE 6)
48" R.
30" R.
12"
24" R.
.250"
102°
2" ± 1/8"
TRANSPARENT PROTECTIVE COATING (OPTIONAL)
3.109"
REFERENCE LINE (NOTE 2)
1.125" +.031" -.025"
SMALL-BUTTON NEOEIGHTAR 7-PIN BASE ARRANGEMENT I JEDEC Nº B7-208 (NOTE 3)
2.16"



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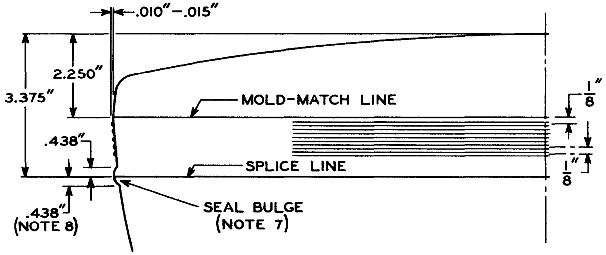


DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-126 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUITRY CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

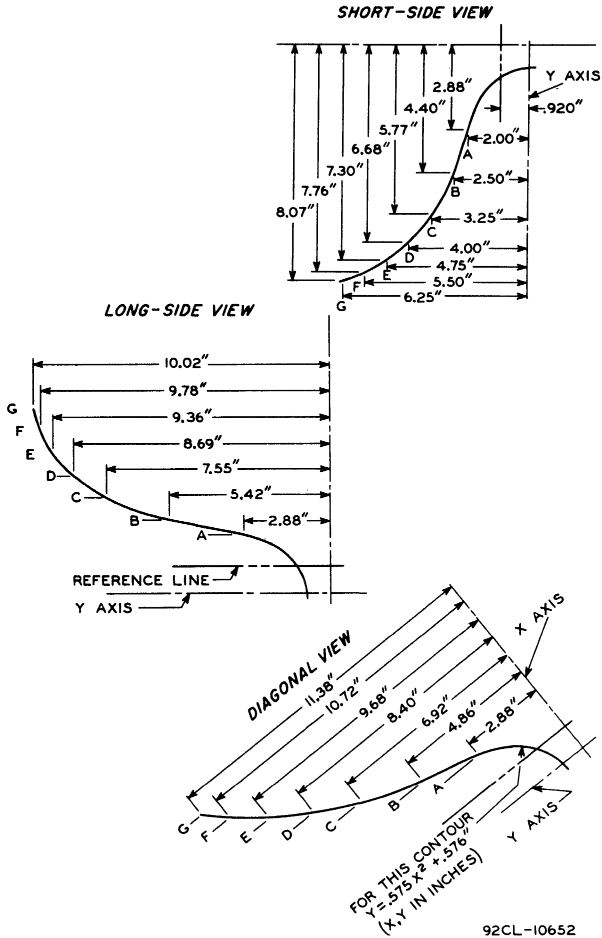
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: MEASURED AT THE MOLD-MATCH LINE.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMENSIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.

NOTE 8: AREA BETWEEN MOLD-MATCH LINE AND SEAL BULGE IS 1/2" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND. SUPPORTS MUST BE SPACED FROM THE TUBE BY THE USE OF CUSHIONING PADS MADE OF ASPHALT, IMPREGNATED FELT OR EQUIVALENT.

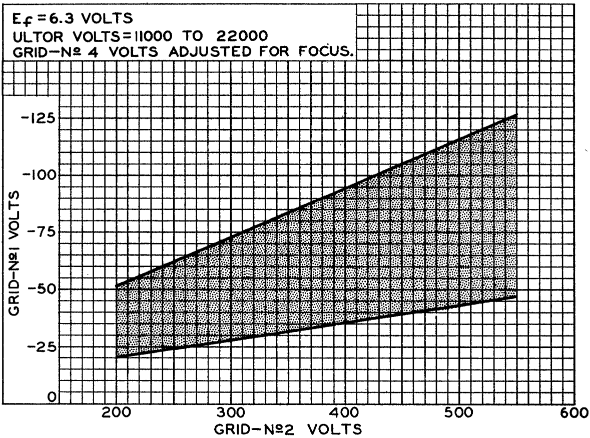
BULB-CONTOUR DIMENSIONS



NOTE: PLANES A THRU G ARE NORMAL TO THE TUBE AXIS AND AT FIXED LOCATIONS FROM THE Y AXIS. THESE COORDINATES DESCRIBE THE BOGIE-BULB EXTERNAL CONTOUR IN PLANES THROUGH THE TUBE AXIS AND THE RESPECTIVE FACEPLATE AXES.

RASTER-CUTOFF-RANGE CHARTS

Grid-Drive Service



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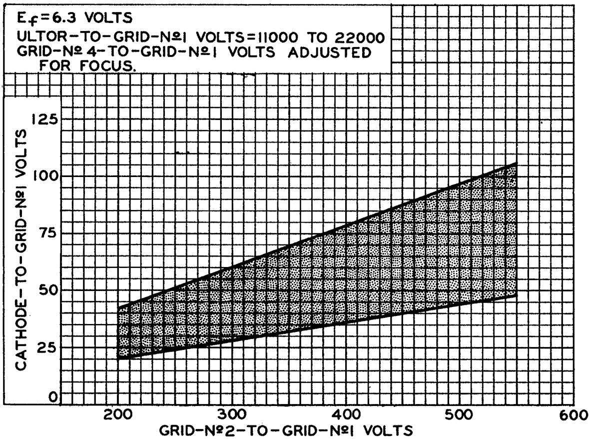
Cathode-Drive Service



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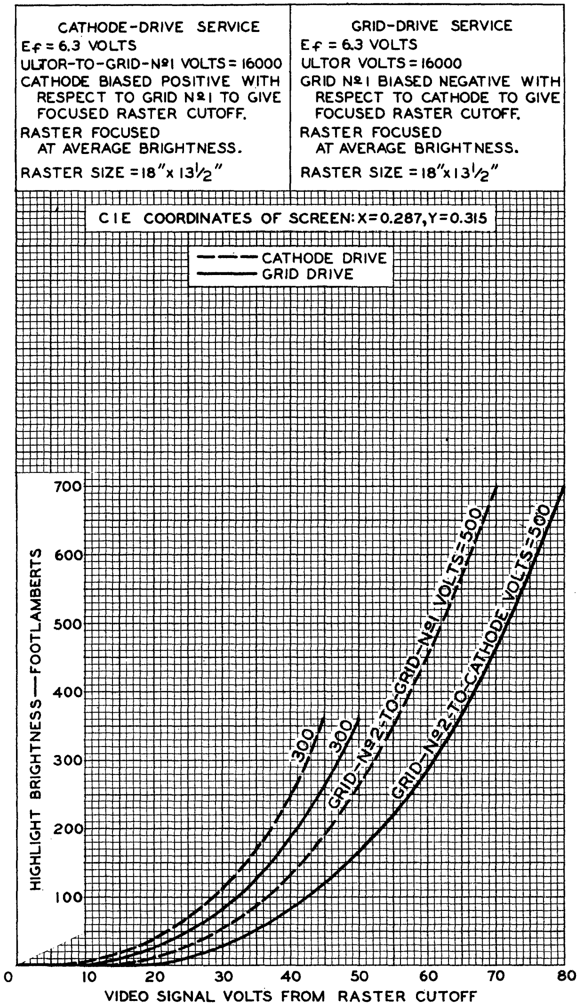
AVERAGE DRIVE CHARACTERISTICS



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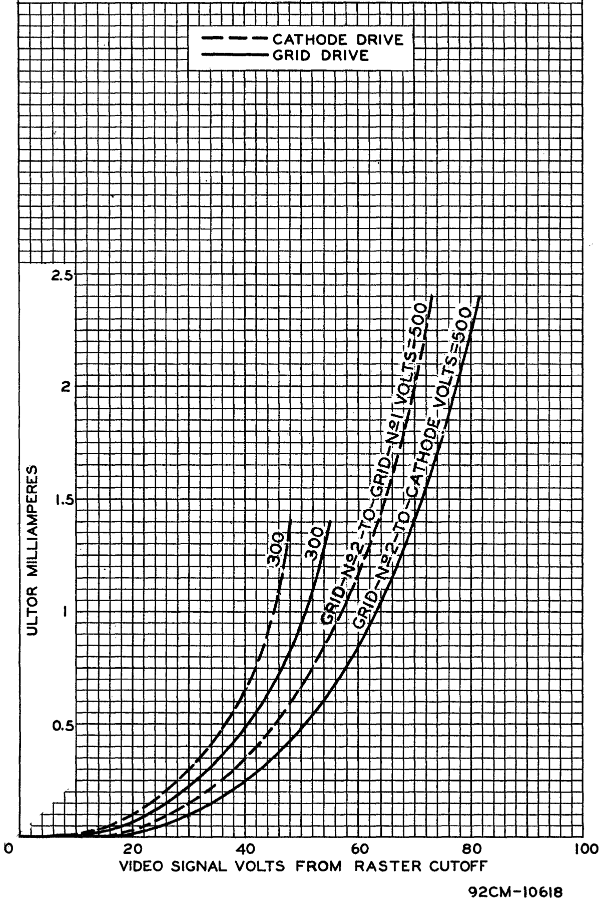
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f=6.3 VOLTS ULTOR-TO-GRID-No.1 VOLTS=11000 TO 22000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF.	E_f=6.3 VOLTS ULTOR VOLTS=11000 TO 22000 GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



23UP4

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **110° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	450 ± 5%	ma
Heater Warm-Up Time (Average)	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes . . .	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor. . .	2500 max.	μμf
	2000 min.	μμf

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

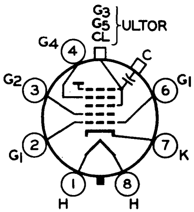
Optical:

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 *Picture-Tube Dimensional-Outlines* and *Bulb J187 A* sheets at the front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . .Small-Button Neoeightar 7-Pin, Arrangement 1 (JEDEC No.B7-208)
Basing Designation for BOTTOM VIEW. 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



Cap - Ultor (Grid No.3, Grid No.5, Collector)
C - External Conductive Coating

Maximum and Minimum Ratings, *Design-Maximum Values:*

ULTOR VOLTAGE	18000 max.	volts
	10000 min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
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

Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS **92° MAGNETIC DEFLECTION**

With Heater Having Controlled Warm-Up Time

GENERAL DATA

Electrical:

Heater Current at 6.3 volts	600 ± 5%	ma
Heater Warm-Up Time (Average)	11	seconds
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes . . .	6	$\mu\mu f$
Cathode to all other electrodes	5	$\mu\mu f$
External conductive coating to ultor. .	{2500 max.	$\mu\mu f$
	{2000 min.	$\mu\mu f$

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

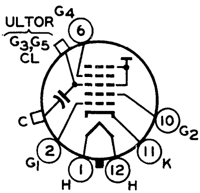
Optical:

Faceplate and Protective Panel. . . . . Filterglass
Light transmission (Approx.). 40%
Phosphor (For curves, see front of this Section) . P4—Sulfide Type, Aluminized

Mechanical:

Operating Position. Any
Weight (Approx.). . . . . 34-1/2 lbs
Overall Length. . . . . 18-5/16" ± 7/16"
Neck Length . . . . 5-1/2" ± 3/16"
Projected Area of Screen. . . . . 282 sq. in.
External Conductive Coating:
Type. . . . . .Regular Band
Contact area for grounding. . . . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
See *Picture-Tube Dimensional-Outlines* and *Bulb J187 D/G* sheets at the front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . .Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)
Basing Designation for BOTTOM VIEW. 12L

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Grid No.4
Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater



Cap - Ultor (Grid No.3, Grid No.5, Collector)
C - External Conductive Coating

Maximum and Minimum Ratings, *Design-Maximum Values:*

ULTOR VOLTAGE	22000 max.	volts
	12000 min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 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

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **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 $\mu\mu f$
  Cathode to all other electrodes . . . . . . 5 $\mu\mu f$
  External conductive coating to ultor. . . . {2500 max. $\mu\mu f$ / 2000 min. $\mu\mu f$}
Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

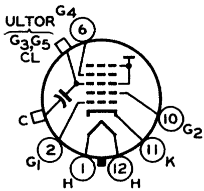
Optical:

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

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

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PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . 6.3 . . . . .ac or dc volts
- Current . . . . 0.6 ± 10% . . . . amp

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . 6 $\mu\mu$f
- Cathode to all other electrodes . . . . 5 $\mu\mu$f
- External conductive coating to ultor. . {2500 max. $\mu\mu$f / 2000 min. $\mu\mu$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

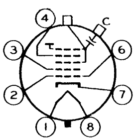
Focusing Method . . . . Electrostatic
Deflection Method . . . . .Magnetic
Deflection Angles (Approx.):
- Diagonal. . . . . 110°
- Horizontal. . . . . 105°
- Vertical. . . . . 87°

Electron Gun. . . . . Type Requiring No Ion-Trap Magnet
Tube Dimensions:
- Overall length. . . . . 15-7/8" ± 5/16"
- Greatest width. . . . . 22-11/16" ± 1/8"
- Greatest height . . . . 18-1/2" ± 1/8"
- Diagonal. . . . . 24" ± 1/8"
- Neck length . . . . 5-7/16" ± 1/8"

Screen Dimensions (Minimum):
- Greatest width. 21-7/16"
- Greatest height . . . . 16-7/8"
- Diagonal. . . . . 22-13/16"
- Projected area. . . . . 332 sq. in.

Weight (Approx.). . . . . 28 lbs
Mounting Position . . . . Any
Cap . . . . .Recessed Small Cavity (JETEC No.J1-21)
Bulb. . . . . J192 (110°)
Base. . . . . Small-Button Eightar 7-Pin, Arrangement 2, (JETEC No.B7-183)
- Basing Designation for BOTTOM VIEW. 8HR

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



Cap - Ultor (Grid No.3, Grid No.5, Collector)
C - External Conductive Coating

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GRID-DRIVE▲ SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	20000 max. / 12000# min.	volts / volts
GRID-No.4 VOLTAGE:		
Positive value.	1000 max.	volts
Negative value.	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	200 max.	volts
Negative bias value	140 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	410 max.	volts
After equipment warm-up period. . . .	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With any ultor voltage ($E_{c_5}k$) between 12000 and 20000 volts and grid-No.2 voltage ($E_{c_2}k$) between 200 and 500 volts

Grid-No.4 Voltage for Focus§.	-50 to +350	volts
Grid-No.1 Voltage (Ec_1k) for Visual Extinction of Focused Raster. .	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	Same value as determined for Ec_1k except video drive is a positive voltage	
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*. .	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*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.

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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 (Ec_5g_1) between 12000 and 20000 volts and grid-No.2-to-grid-No.1 voltage (Ec_2g_1) between 225 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for Focus§ . . . . -50 to +350 volts

■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

✠ This value is a working design-center minimum. The equivalent *absolute minimum* ultor-or ultor-to-grid-No.1 voltage is 11000 volts, below which the serviceability of the 24AHP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor-or ultor-to-grid-No.1 voltage is never less than 11000 volts.

*,§: See next page.

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Cathode-to-Grid-No.1 Voltage (Ek_{g_1}) for Visual Extinction of Focused Raster. . . .	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*		
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative). . . .	Same value as determined for Ek_{g_1} except video drive is a negative voltage		
Grid-No.4 Current.	-25 to +25		μa
Grid-No.2 Current.	-15 to +15		μa
Field Strength of Adjustable Centering Magnet* .	0 to 8		gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*14000*	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for Focus . .	-50 to +350	-50 to +350	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	28 to 60	36 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value.	-28 to -60	-36 to -78	volts

Maximum Circuit Values:

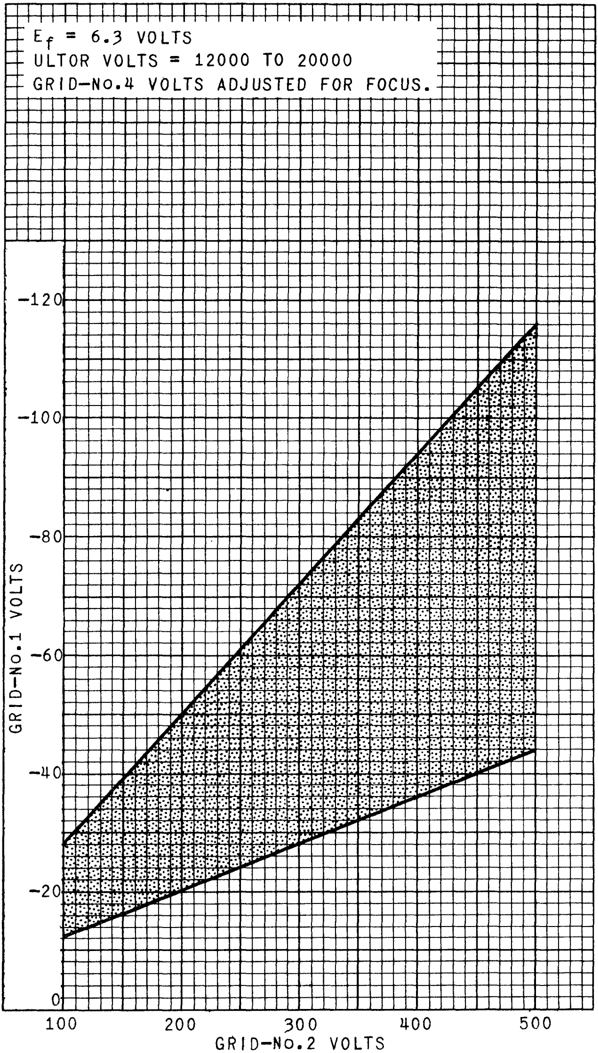
Grid-No.1-Circuit Resistance.	1.5 max.	megohms

* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 7/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

§ The grid-No.4 voltage or grid-No.4-to-grid-No.1 voltage required for focus of any individual tube is independent of ultor current and will remain essentially constant for values of ultor voltage (or ultor-to-grid-No.1 voltage) or grid-No.2 voltage (or grid-No.2-to-grid-No.1 voltage) within design ranges shown for these items.

For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

24AHP4
RASTER-CUTOFF-RANGE CHART
For Grid-Drive Service



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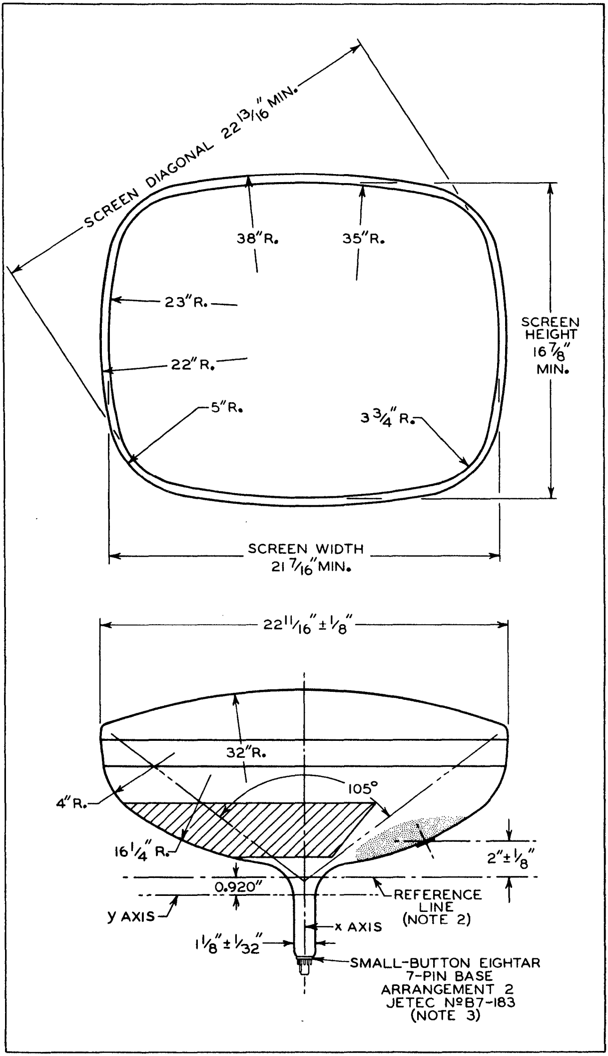

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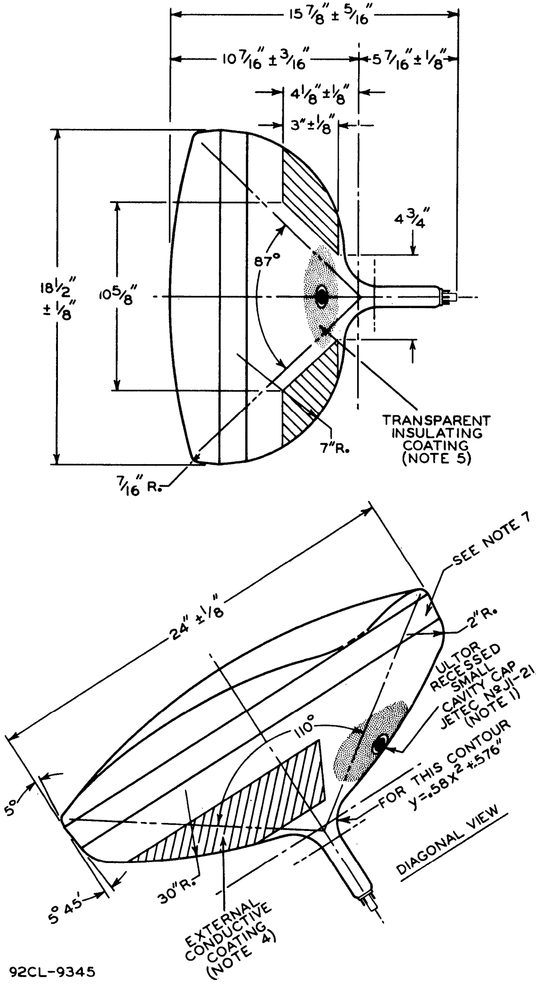
PICTURE TUBE



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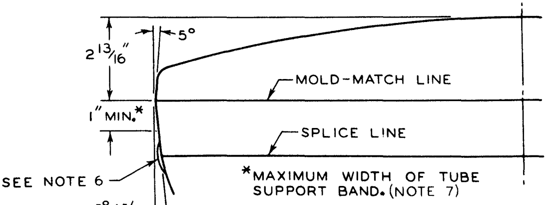
PICTURE TUBE



DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^{\circ}$. 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.

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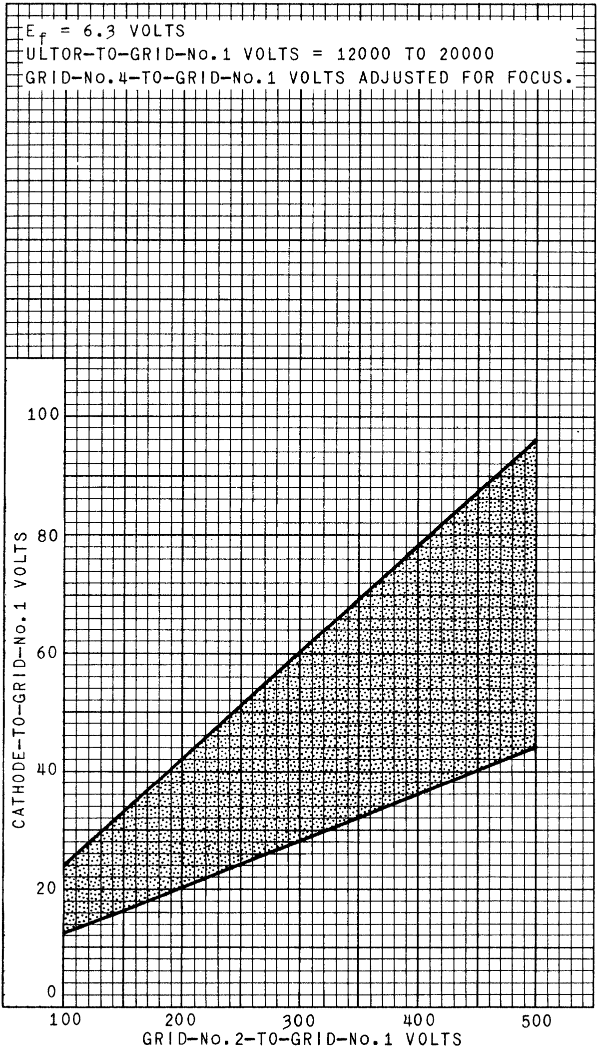
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

24AHP4

24AHP4

RASTER-CUTOFF-RANGE CHART
For Cathode-Drive Service



ELECTRON TUBE DIVISION
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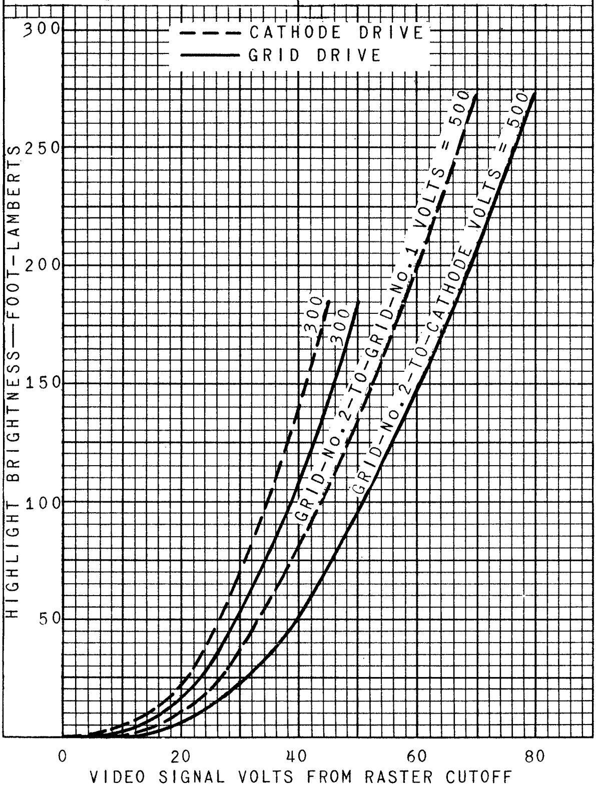
92CS-9350

RCA

24AHP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-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"	E_f = 6.3 VOLTS ULTOR VOLTS = 16000 GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS. RASTER SIZE = 21" x 16"



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CS-9352

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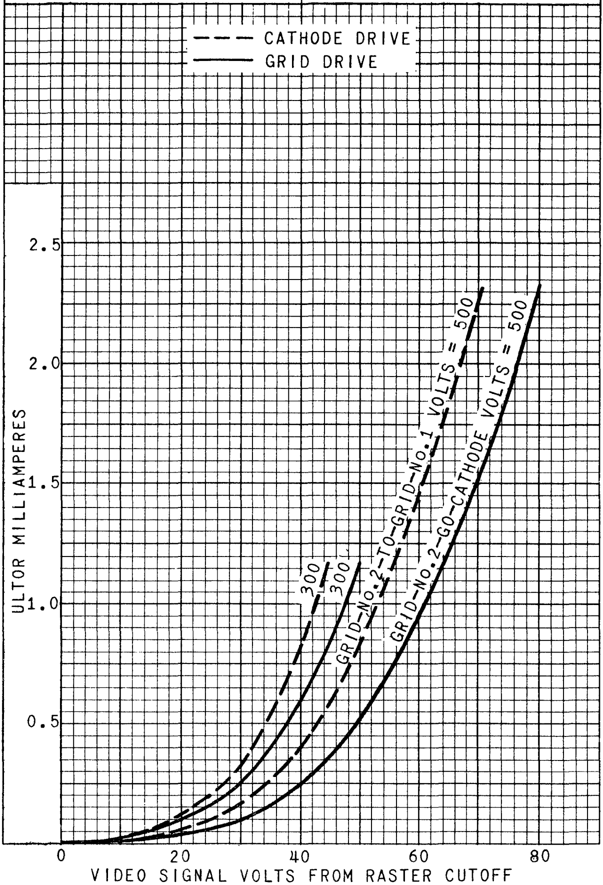
24AHP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE–DRIVE SERVICE	GRID–DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR–TO–GRID–No.1 VOLTS = 12000 TO 20000	ULTOR VOLTS = 12000 TO 20000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF.	GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CS–9351

Picture Tube

RECTANGULAR GLASS TYPE — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **MAGNETIC DEFLECTION**
LOW GRID-No.2 VOLTAGE — **CATHODE-DRIVE TYPE**

With Heater Having Controlled Warm-Up Time

DATA

General:

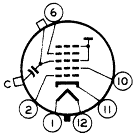
Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3	volts
Current at 6.3 volts	0.6	amp
Warm-up time (Average)	11	sec
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	$\mu\mu f$
Cathode to all other electrodes	5	$\mu\mu f$
External conductive coating to ultor	2500 max. / 2000 min.	$\mu\mu f$

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" ± 3/8"
  Greatest width . . . . . 22-11/16" ± 1/8"
  Greatest height . . . . . 18-7/16" ± 1/8"
  Diagonal . . . . . 24" ± 1/8"
  Neck length . . . . . 5-1/2" ± 3/16"
  Radius of curvature of faceplate (External surface) . . . . . 40"
Screen Dimensions (Minimum):
  Greatest width . . . . . 21-7/16"
  Greatest height . . . . . 16-7/8"
  Diagonal . . . . . 22-13/16"
  Projected area . . . . . 332 sq. in.
Weight (Approx.) . . . . . 35 lbs
Operating Position . . . . . Any
Cap . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Bulb J192 A2/B2
Socket . . . . . Cinch Part No.9464-12, or equivalent
Base . . . . . Small-Shell Duodecal 6-Pin, Arrangement 1, (JEDEC Group 4, No.B6-63)

24ATP4

Basing Designation for BOTTOM VIEW. 12L

Pin 1 – Heater
Pin 2 – Grid No.1
Pin 6 – Grid No.4
Pin 10 – Grid No.2
Pin 11 – Cathode
Pin 12 – Heater



Cap – Ultor (Grid No.3, Grid No.5, Collector)
C – External Conductive Coating

CATHODE-DRIVE■ SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No.1

Maximum and Minimum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE.	20000	max.	volts
	12000♣	min.	volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:			
Positive value.	1000	max.	volts
Negative value.	500	max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	68	max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:			
Positive-peak value	200	max.	volts
Positive-bias value	140	max.	volts
Negative-bias value	0	max.	volts
Negative-peak value	0	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds.	410	max.	volts
After equipment warm-up period. . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($Ec_{5}g_{1}$) between 12000♣ and 20000 volts and grid-No.2-to-grid-No.1 voltage ($Ec_{2}g_{1}$) between 40 and 68 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§. 0 to 400 volts

Cathode-to-Grid-No.1 Voltage (Ek_{g_1}) for visual extinction of focused raster▲. . . . . . See *Raster-Cutoff-Range Chart for Cathode-Drive Service*

Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level):
White-level value (Peak negative) . . . . Same value as determined for Ek_{g_1} except video drive is a negative voltage

Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet*	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*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.

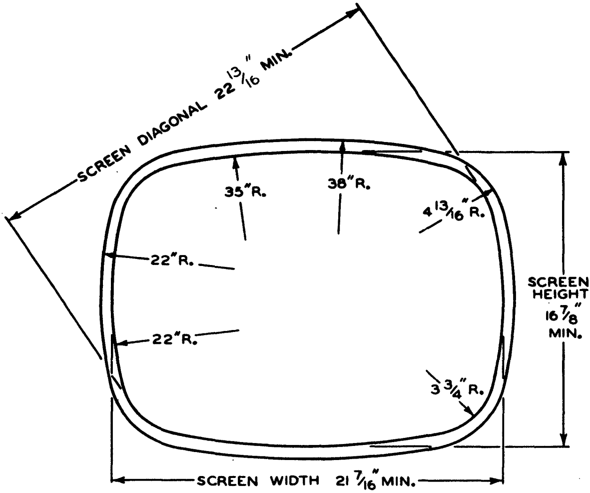
▲ The cathode-to-grid-No.1 voltage (Ek_{g1}) will increase by approximately 2 per cent for every 1000-volt increase in ultor-to-grid-No.1 voltage and will decrease by approximately 2 per cent for every 1000-volt decrease in ultor-to-grid-No.1 voltage.

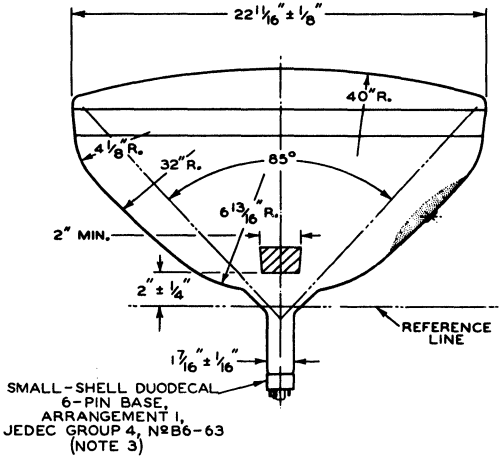
* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 1/2-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

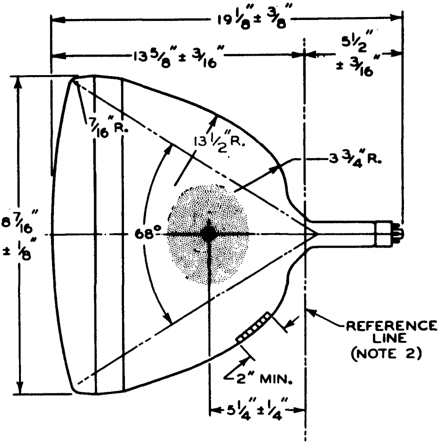
OPERATING CONSIDERATIONS

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.

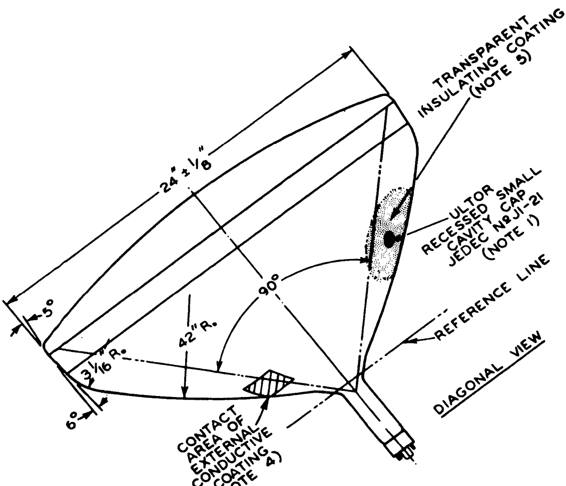
For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section


SCREEN DIAGONAL 22 13/16" MIN.
35"R.
38"R.
4 13/16" R.
22"R.
22"R.
SCREEN HEIGHT 16 7/8" MIN.
3 3/4" R.
SCREEN WIDTH 21 7/16" MIN.


22 11/16" ± 1/8"
40"R.
4 1/8"R.
32"R.
85°
6 13/16"R.
2" MIN.
2" ± 1/4"
REFERENCE LINE
1 7/16" ± 1/16"
SMALL-SHELL DUODECAL
6-PIN BASE,
ARRANGEMENT 1,
JEDEC GROUP 4, Nº B6-63
(NOTE 3)

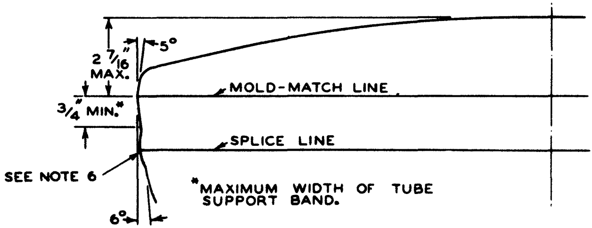


19 1/8" ± 3/8"
13 5/8" ± 3/16"
5 1/2" ± 3/16"
7/16" R.
13 1/2" R.
3 3/4" R.
18 7/16" ± 1/8"
68°
REFERENCE LINE (NOTE 2)
2" MIN.
5 1/4" ± 1/4"



24" ± 1/8"
TRANSPARENT INSULATING COATING (NOTE 5)
ULTOR RECESSED SMALL CAVITY CAP JEDEC № J1-21 (NOTE 1)
REFERENCE LINE
DIAGONAL VIEW
90°
5°
42" R.
3 1/16" R.
6°
CONTACT AREA OF EXTERNAL CONDUCTIVE COATING (NOTE 4)

92CL-10774



DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

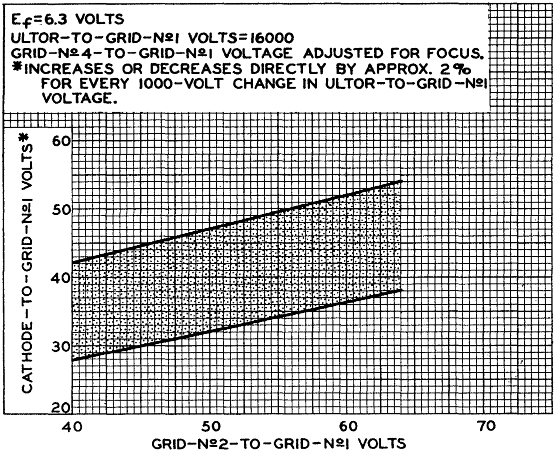
NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

RASTER-CUTOFF-RANGE CHART
Cathode-Drive Service



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24AUP4

PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

With heater having controlled warm-up time

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . 6.3 . . . . ac or dc volts
- Current . . . . 0.6 ± 5% . . . . amp
- Warm-up time (Average) . 11 . . . . sec

For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of Receiving Tube Section.

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . . 6 μμf
- Cathode to all other electrodes . . . . 5 μμf
- External conductive coating to ultor . . . {2500 max. μμf / 1700 min. μμf}

Faceplate, Spherical . . . . Filterglass
- Light transmission (Approx.) 74%

Phosphor (For curves, see front of this Section) . . P4—Sulfide Type Aluminized
- Fluorescence . . . . White
- Phosphorescence . . . . White
  - Persistence . . . . Short

Focusing Method . . . . Electrostatic
Deflection Method . . . . Magnetic
Deflection Angles (Approx.):
- Diagonal . . . . 90°
- Horizontal . . . . 85°
- Vertical . . . . 68°

Electron Gun . . . . Type Requiring No Ion-Trap Magnet
Tube Dimensions:
- Overall length . . . . 18-1/8" ± 3/8"
- Greatest width . . . . 22-11/16" ± 1/8"
- Greatest height . . . . 18-7/16" ± 1/8"
- Diagonal . . . . 24" ± 1/8"
- Neck length . . . . 4-1/2" ± 3/16"
- Radius of curvature of faceplate (External surface) . . 40"

Screen Dimensions (Minimum):
- Greatest width . . . . 21-7/16"
- Greatest height . . . . 16-7/8"
- Diagonal . . . . 22-13/16"
- Projected area . . . . 332 sq. in.

Weight (Approx.) . . . . 32-1/2 lbs
Operating Position . . . . Any
Cap . . . . Recessed Small Cavity (JEDEC No.J1-21)
Bulb J192A/B
Base . . . . Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203), or Small-Shell Duodecal 6-Pin, Arrangement 1 (JEDEC Group 4, No.B6-63)

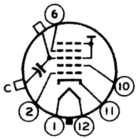
RCA

24AUP4

PICTURE TUBE

Basing Designation for BOTTOM VIEW 12L

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Grid No.4
Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater



Cap - Ultor (Grid No.3, Grid No.5, Collector)
C - External Conductive Coating

GRID-DRIVE▲ SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	20000	max.	volts
	12000✠	min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:			
Positive value	1000	max.	volts
Negative value	500	max.	volts
GRID-No.2 VOLTAGE.	500	max.	volts
GRID-No.1 VOLTAGE:			
Negative-peak value.	200	max.	volts
Negative-bias value.	140	max.	volts
Positive-bias value.	0	max.	volts
Positive-peak value.	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds	410	max.	volts
After equipment warm-up period . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c_5k}) between 12000 and 20000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for focus§	-75 to +400	volts
Grid-No.1 Voltage (E_{c_1k}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Grid-Drive Service*	
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive).	Same value as determined for E_{c_1k} except video drive is a positive voltage	
Grid-No.4 Current.	-25 to +25	μa

▲,✠,§: See next page.

24AUP4

PICTURE TUBE

Grid-No.2 Current.	-15 to +15	μa
Field Strength of Adjustable Centering Magnet†.	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*18000*	***volts***
and grid-No.2 voltage of	*300*	***volts***
Grid-No.4 Voltage for focus . . .	-75 to +400	volts
Grid-No.1 Voltage for visual extinction of focused raster. .	-35 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value	35 to 72	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance.	1.5 max.	megohms

CATHODE-DRIVE▪ SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No.1

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE.	20000	max.	volts
	12000✠	min.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:			
Positive value.	1000	max.	volts
Negative value.	500	max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	640	max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	500	max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:			
Positive-peak value	200	max.	volts
Positive-bias value	140	max.	volts
Negative-bias value	0	max.	volts
Negative-peak value	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds.	410	max.	volts
After equipment warm-up period. . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) 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§.	-75 to +400	volts
Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster	*See Raster-Cutoff-Range Chart for Cathode-Drive Service*	

▲,✠,§,†,▪: See next page.

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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	μa
Grid-No.2 Current	-15 to +15	μa
Field Strength of Adjustable Centering Magnet†	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	***18000***	***volts***
and grid-No.2-to-grid-No.1 voltage of	***300***	***volts***
Grid-No.4-to-Grid-No.1 Voltage for focus	-75 to +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.

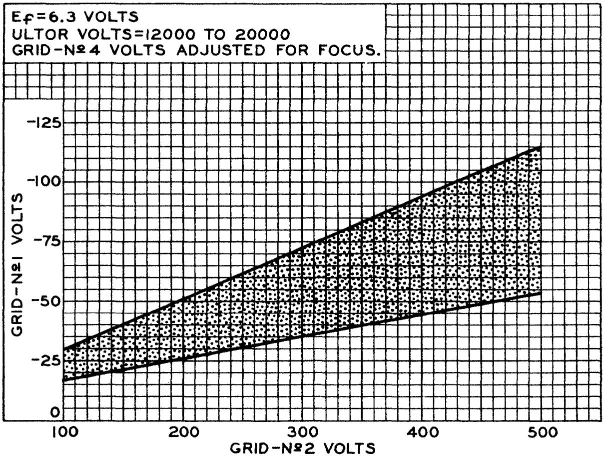
■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and other electrodes.

For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section

RCA

24AUP4

RASTER-CUTOFF-RANGE CHARTS
GRID-DRIVE SERVICE



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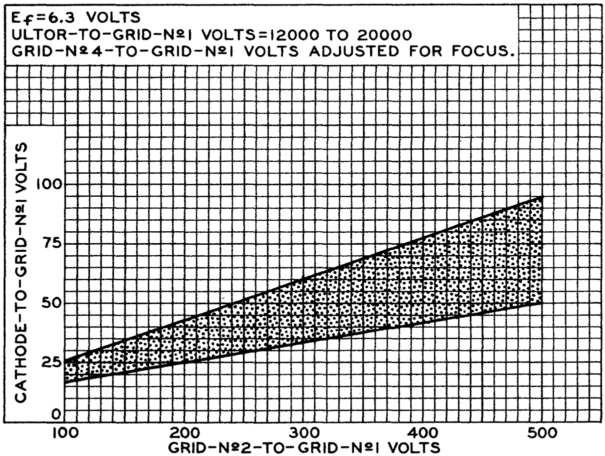
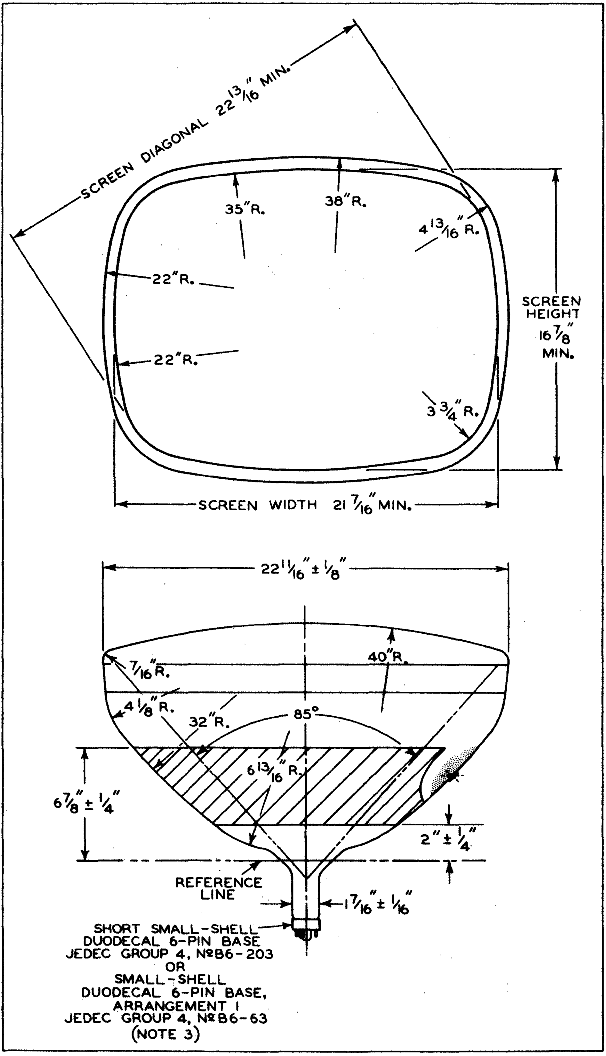
CATHODE-DRIVE SERVICE



92CS-9918

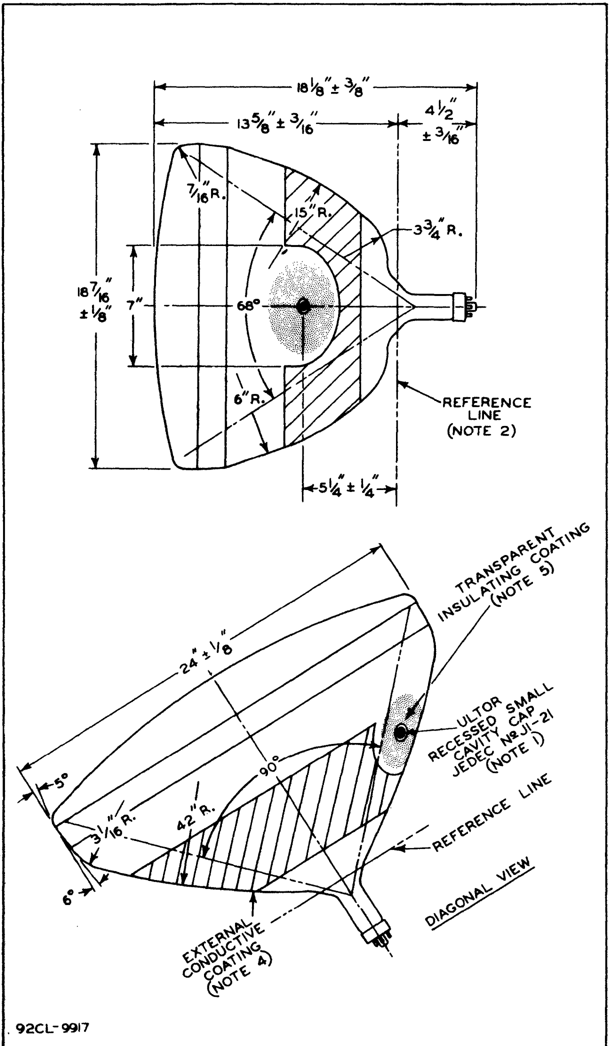
24AUP4

24AUP4
PICTURE TUBE



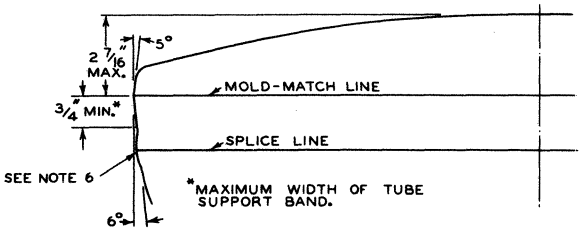
24AUP4

24AUP4
PICTURE TUBE



24AUP4

PICTURE TUBE



DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No. G-116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

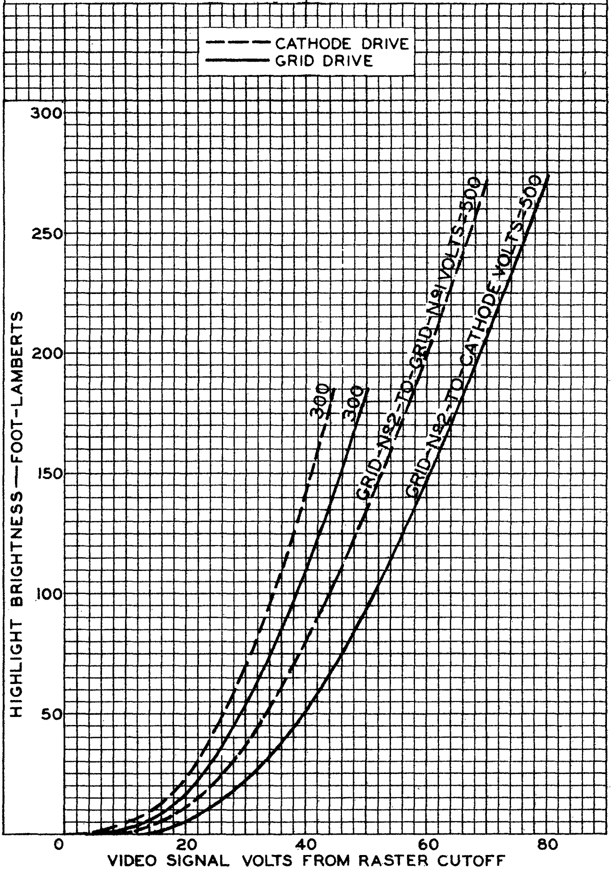
NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

RCA

24AUP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-Nº1 VOLTS = 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID Nº1 TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS. RASTER SIZE = 21" x 16"	E_f = 6.3 VOLTS ULTOR VOLTS = 16000 GRID Nº1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS. RASTER SIZE = 21" x 16"



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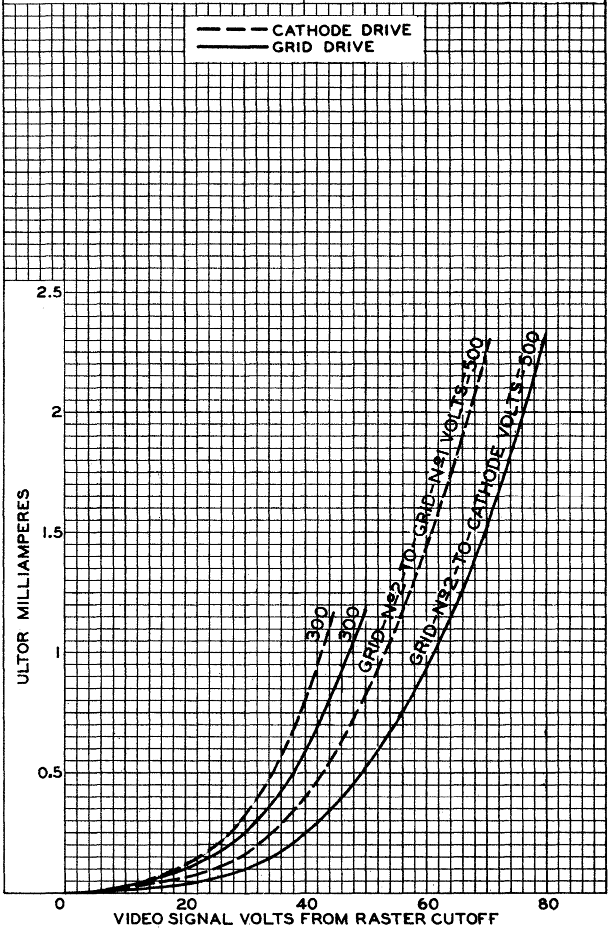
24AUP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f=6.3 VOLTS ULTOR-TO-GRID-№1 VOLTS= 12000 TO 20000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF.	E_f=6.3 VOLTS ULTOR VOLTS=12000 TO 20000 GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



RCA

24BAP4
PICTURE TUBE

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	$\mu\mu f$
Cathode to all other electrodes	5	$\mu\mu f$
External conductive coating to ultor	2500 max.	$\mu\mu f$
	1700 min.	$\mu\mu f$ ←
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		76%
Phosphor (For curves, see front of this Section)		P4—Sulfide Type Aluminized
Fluorescence		White
Phosphorescence		White
Persistence		Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		110°
Horizontal		105°
Vertical		87°
Electron Gun		Type Requiring No Ion-Trap Magnet
Tube Dimensions:		
Overall length		15-7/8" ± 5/16"
Greatest width		22-11/16" ± 1/8"
Greatest height		18-1/2" ± 1/8"
Diagonal		24" ± 1/8"
Neck length		5-7/16" ± 1/8"
Radius of curvature of faceplate (External surface)		32"
Screen Dimensions (Minimum):		
Greatest width		21-7/16"
Greatest height		16-7/8"
Diagonal		22-13/16"
Projected area		332 sq. in.
Weight (Approx.)		28 lbs
Operating Position		Any
Cap		Recessed Small Cavity (JEDEC No.J1-21)
Bulb		J192 C1/D1
Socket		Ucinite Part No.115446, or equivalent
Base		Small-Button Eightar 7-Pin, Arrangement 2, (JEDEC No.B7-183)

← Indicates a change.

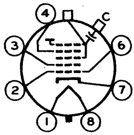
24BAP4

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 - Ultor (Grid No.3, Grid No.5, Collector)
C - External Conductive Coating

CATHODE-DRIVE■ SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No.1

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE.	20000	max.	volts
	12000⊕	min.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:			
Positive value.	1000	max.	volts
Negative value.	500	max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	64	max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:			
Positive-peak value	200	max.	volts
Positive-bias value	140	max.	volts
Negative-bias value	0	max.	volts
Negative-peak value	2	max.	volts
→ PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds.	410	max.	volts
After equipment warm-up period. . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

→ *With any ultor-to-grid-No.1 voltage (Ec_5g_1) between 12000 and 20000 volts and grid-No.2-to-grid-No.1 voltage (Ec_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 (Ek_{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 Ek_{g_1} except video drive is a negative voltage	
Grid-No.4 Current.	-25 to +25	μa
Grid-No.2 Current.	-15 to +15	μa
Field Strength of Adjustable Centering Magnet▲.	0 to 8	gausses

→ Indicates a change.

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24BAP4

PICTURE TUBE

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*20000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*50*	*64*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for focus.	0 to 400	0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	32 to 47	42 to 58	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value.	-32 to -47	-42 to -58	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . 1.5 max. megohms

■ Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

⊕ This value is a working design-center minimum. The equivalent *absolute minimum* ultor-to-grid-No.1 voltage is 11,000 volts below which the serviceability of the 24BAP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor-to-grid-No.1 voltage is never less than 11,000 volts.

§ The grid-No.4-to-grid-No.1 voltage required for optimum focus of any individual tube may have a value anywhere between 0 and 400 volts; is independent of ultor current; and will remain essentially constant for values of ultor-to-grid-No.1 voltage, or grid-No.2-to-grid-No.1 voltage, within design ranges shown for these items.

▲ Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

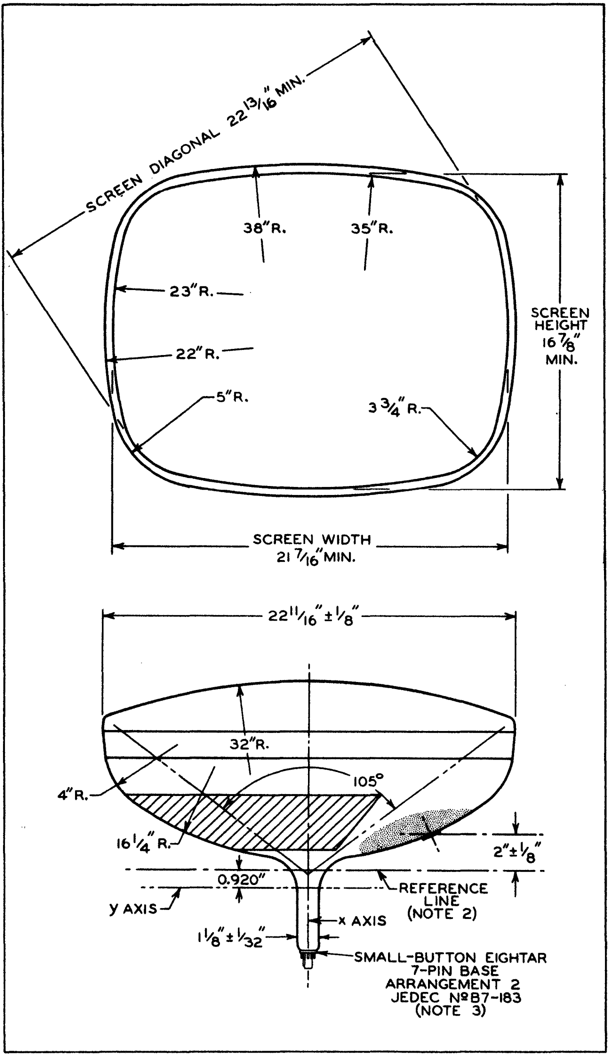
OPERATING CONSIDERATIONS

X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, the 24BAP4 does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 22 kilovolts (Absolute-maximum value), shielding of the 24BAP4 for X-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

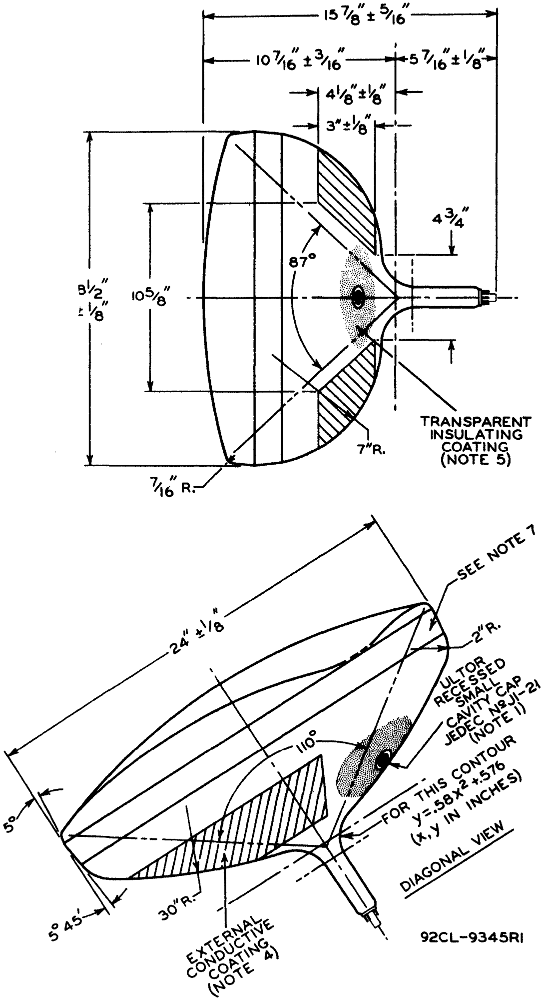
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 24BAP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

24BAP4

24BAP4
PICTURE TUBE



24BAP4
PICTURE TUBE



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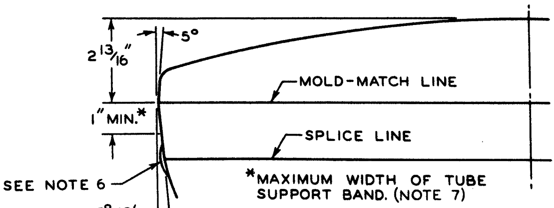
24BAP4

PICTURE TUBE



DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No. G-126 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

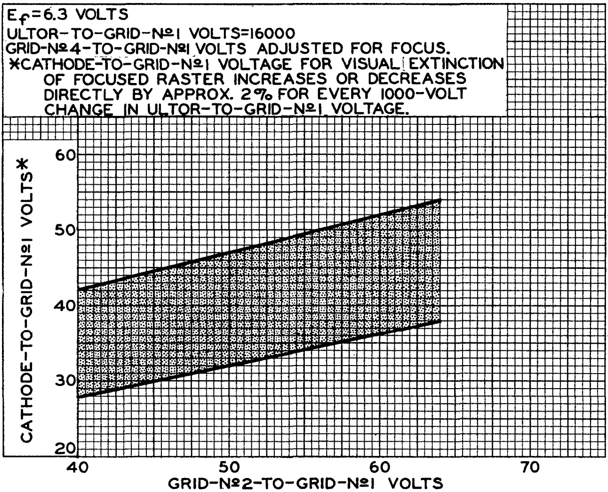
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

NOTE 7: WIDTH OF UNDISTURBED REGION BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 1" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

24BAP4

RASTER-CUTOFF-RANGE CHART



92CS-9945R1

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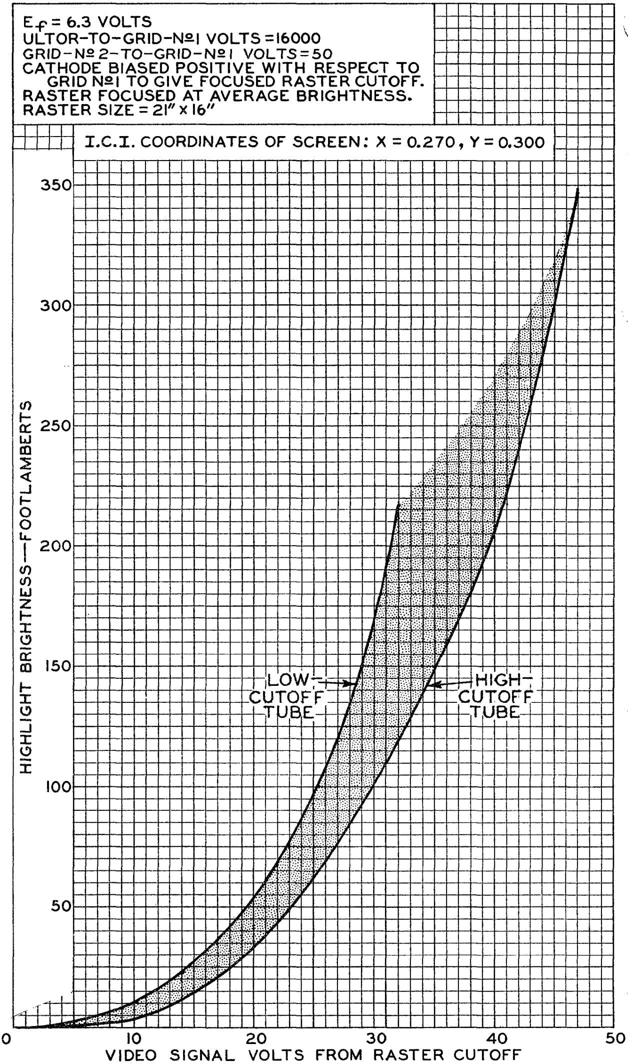
24BAP4

CATHODE-DRIVE CHARACTERISTICS



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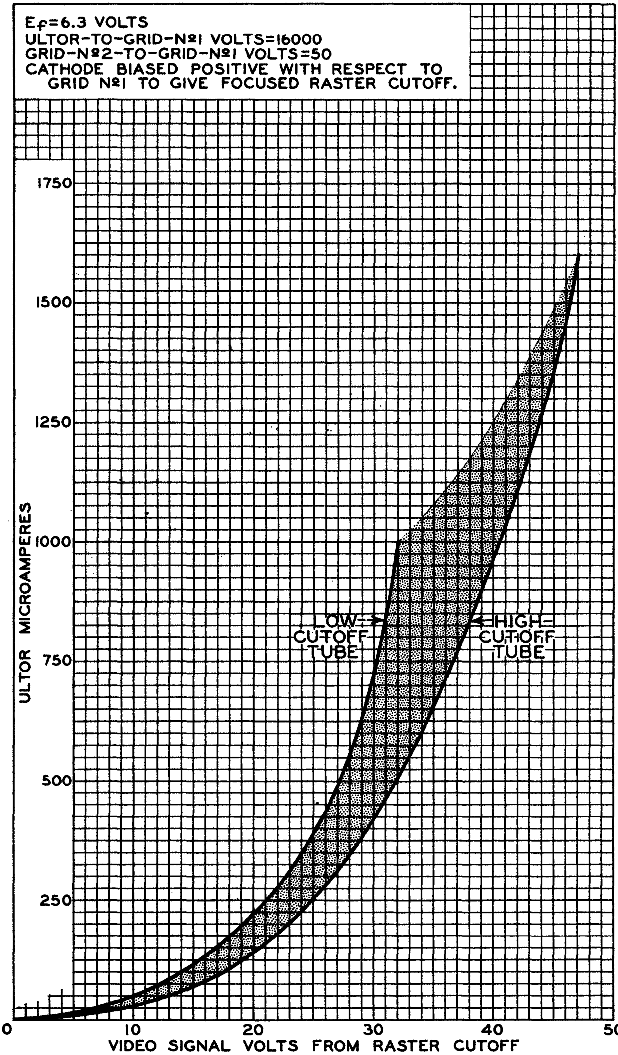
24BAP4

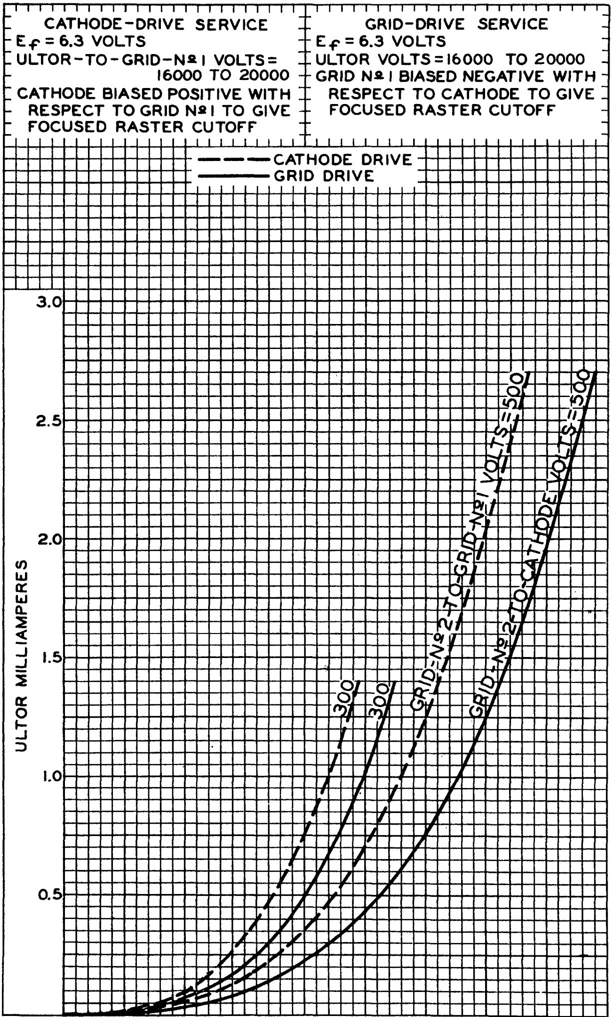
CATHODE-DRIVE CHARACTERISTICS



RCA

24CP4-A

AVERAGE DRIVE CHARACTERISTICS



24CP4A

Picture Tube

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — 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.	μμf
	2000 min.	μμf

Electron Gun. . . . . Ion-Trap Type Requiring External Single-Field Magnet

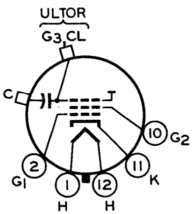
Optical:

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 *Picture-Tube Dimensional-Outlines* and *Bulb J192 A/B* sheets at the front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . .Small-Shell Duodecal 5-Pin (JEDEC Group 4, No.B5-57)
Basing Designation for BOTTOM VIEW. 12N

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater



Cap - 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

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

RCA

27MP4

PICTURE TUBE

27MP4

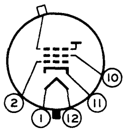
RECTANGULAR METAL-SHELL TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp
Faceplate, Compound Spherical	Frosted Filterglass
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Deflection Angles (Approx.):	
Diagonal	90°
Horizontal	85°
Vertical	69°
Electron Gun	Ion-Trap Type Requiring External Single-Field Magnet
Tube Dimensions:	
Maximum overall length	22-3/16"
Greatest width at lip	25-1/4" ± 3/16"
Greatest height at lip	19-15/16" ± 3/16"
Diagonal at lip	26-7/8" ± 1/4"
Neck length	7-1/2" ± 3/16"
Radius of curvature of faceplate (External surface)	♦
Screen Dimensions (Minimum):	
Greatest width	23-7/16"
Greatest height	18-1/8"
Diagonal	25-1/16"
Operating Position	Any
Ultor Terminal	Metal-Shell Lip
Base	Small-Shell Duodecal 5-Pin (JETEC Group 4, No.B5-57)
Basing Designation for BOTTOM VIEW	12D

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater



Metal-Shell Lip - Ultor (Grid No.3, Collector)

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value	125 max.	volts
Positive-bias value	0 max.	volts
Positive-peak value	2 max.	volts

♦: See next page.

← Indicates a change.

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27MP4

PICTURE TUBE

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms

♦ Within major area, the radius of curvature is 40". The curvature of the surface at the boundary of this area blends into the rim and has a perimetrical shape conforming to the surface of a sphere having a 50" radius.

For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

27RP4
PICTURE TUBE

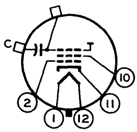
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage (AC or DC)	6.3 volts
Current	0.6 ± 10% amp
Capacitance between External Conductive Coating and Ultor	2500 max. $\mu\mu$f 500 min. $\mu\mu$f
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
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 — **ALUMINIZED SCREEN**
LOW-VOLTAGE ELECTROSTATIC FOCUS — **90° MAGNETIC DEFLECTION**

GENERAL DATA

Electrical:

Heater Current at 6.3 volts . . . . 600 ma
Direct Interelectrode Capacitances:
  Grid No.1 to all other electrodes . . . . . 6 $\mu\mu$f
  Cathode to all other electrodes . . . . . . 5 $\mu\mu$f
  External conductive coating to ultor. . . . {2500 max. $\mu\mu$f / 2000 min. $\mu\mu$f}
Electron Gun. . . . . Type Requiring No Ion-Trap Magnet

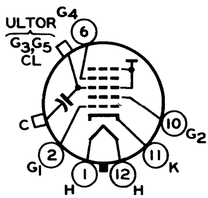
Optical:

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" ± 3/8"
Neck Length . . . . 5-1/2" ± 3/16"
Projected Area of Screen. . . . . 425 sq. in.
External Conductive Coating:
  Type. . . . . .Regular Band
  Contact area for grounding. . . . . Near Reference Line
For Additional Information on Coatings and Dimensions:
  See *Picture-Tube Dimensional-Outlines* and *Bulb J214-1/2 A* sheets at the front of this section
Cap . . . . .Recessed Small Cavity (JEDEC No.J1-21)
Base. . . . . Small-Shell Duodecal 6-Pin, Arrangement 1 (JEDEC Group 4, No.B6-63)
  Basing Designation for BOTTOM VIEW. 12L

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 6 - Grid No.4
Pin 10 - Grid No.2
Pin 11 - Cathode
Pin 12 - Heater



Cap - Ultor (Grid No.3, Grid No.5, Collector)
C - External Conductive Coating

Maximum Ratings, *Design-Maximum Values:*

ULTOR VOLTAGE . . . . 20000 max. volts
GRID-No.4 (FOCUSING) VOLTAGE:
  Positive value. . . . . 1100 max. volts
  Negative value. . . . . 550 max. volts
GRID-No.2 VOLTAGE . . . . 550 max. volts

GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	450 max.	volts
After equipment warm-up period. . . .	200 max.	volts
Heater positive with respect to cathode.	200 max.	volts

Typical Operating Conditions:

With ultor voltage of	*16000*	*volts*
and grid-No.2 voltage of	*300*	*volts*
Grid-No.4 Voltage for focus	-72 to +396	volts
Grid-No.1 Voltage for visual extinction of focused raster	-28 to -72	volts

Maximum Circuit Values:

Grid-No.1 Circuit Resistance:	1.5 max.	megohms

For X-radiation shielding considerations, see sheet *X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES* at front of this section

RCA

902-A

HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 902

General:

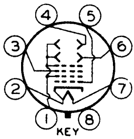
Heater, for Unipotential Cathode:
- Voltage . . . . 6.3 ± *10%* . . . . ac or dc volts
- Current . . . . 0.6 . . . . amp.

Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to All Other Electrodes . . . . 7.5 . . . . μμf
- DJ_1 to All Other Electrodes . . . . 8.5 . . . . μμf
- DJ_4 to All Other Electrodes . . . . 6.0 . . . . μμf

Phosphor (For Curves, see front of this Section) . . . No.1
- Fluorescence . . . . Green
- Persistence . . . . Medium

Focusing Method . . . . Electrostatic
Deflection Method . . . . Electrostatic
Overall Length . . . . 7-7/16" ± 3/16"
Greatest Diameter of Bulb . . . . 2" ± 1/16"
Minimum Useful Screen Diameter . . . . 1-3/4"
Mounting Position . . . . Any
Base . . . . Medium Shell Octal 8-Pin
- Basing Designation for BOTTOM VIEW 8CD

Pin 1 - Grid No.2, Anode No.2, Deflecting Electrode DJ_2, Deflecting Electrode DJ_3
Pin 2 - Heater, Cathode



Pin 3 - Anode No.1
Pin 4 - Deflecting Electr. DJ_1
Pin 5 - Grid No.1
Pin 6 - Deflecting Electr. DJ_4
Pin 7 - Heater
Pin 8 - No Connection

DJ_1 and DJ_2 are nearer the screen
DJ_3 and DJ_4 are nearer the base

With DJ_1 positive with respect to DJ_2, the spot is deflected toward pin 3. With DJ_3 positive with respect to DJ_4, the spot is deflected toward pin 1.

The angle between the trace produced by DJ_3 and DJ_4 and its intersection with the plane through the tube axis and pin 1 does not exceed 10°.

The angle between the trace produced by DJ_3 and DJ_4 and the trace produced by DJ_1 and DJ_2 is 90° ± 4°.

Maximum Ratings, *Absolute Values*:

ANODE-No.2 & GRID No.2 VOLTAGE . . . . . . 660 *max.* volts
ANODE-No.1 VOLTAGE . . . . 330 *max.* volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:
- Negative Value . . . . 125 *max.* volts
- Positive Value . . . . 0 *max.* volts

PEAK VOLTAGE BETWEEN ANODE No.2 AND DEFLECTING ELECTRODE DJ_1 OR DJ_4 385 *max.* volts

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902-A

HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

Typical Operation:

Anode No.2 & Grid No.2 Voltage★	400	600	volts
Anode No.1 Voltage for Focus at 75% of Grid-No.1 Voltage for Cutoff ●	100	150	volts
Grid-No.1 Volt. for Visual Cutoff#	-40	-60	volts
Max. Anode-No.1 Current Range▲	Between -50 and +10		µamp.
Deflection Sensitivity:			
DJ_1 and DJ_2	0.273	0.183	mm/v dc
DJ_3 and DJ_4	0.326	0.217	mm/v dc
Deflection Factor:**			
DJ_1 and DJ_2	93	139	v dc/in.
DJ_3 and DJ_4	78	117	v dc/in.

★ Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 400 volts.

● Individual tubes may require between +20% and -35% of the values shown with grid-No.1 voltages between zero and cutoff.

Visual extinction of stationary focused spot. Supply should be adjustable to ± 50% of these values.

▲ See curve for average values.

** Individual tubes may vary from these values by ± 20%.

Spot Position:

The undeflected focused spot will fall within a 10-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ_1 and DJ_2. Suitable test conditions are: anode-No.2 voltage, 600 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 megohm each for DJ_1 and DJ_4, connected to anode No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 *max.*	megohms
Impedance of Any Deflecting-Electrode Circuit at Heater-Supply Frequency	1.0 *max.*	megohm
Resistance in Any Deflecting-Electrode Circuit▲▲	5.0 *max.*	megohms

▲▲ It is recommended that both deflecting-electrode-circuit resistances be approximately equal.

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6499
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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	$\mu\mu$f
Deflecting electrode DJ_1 to all other electrodes	13	$\mu\mu$f
Deflecting electrode DJ_2 to all other electrodes	13	$\mu\mu$f
Deflecting electrode DJ_3 to all other electrodes	11.5	$\mu\mu$f
Deflecting electrode DJ_4 to all other electrodes	11.5	$\mu\mu$f
DJ_1 to DJ_2	3	$\mu\mu$f
DJ_3 to DJ_4	3	$\mu\mu$f
Grid No.5 to backing-electrode	800	$\mu\mu$f
Grid No.5 and backing-electrode to collector	4	$\mu\mu$f
Collector to all other electrodes & external cylindrical shield	*See Curve*	

Focusing Method	Electrostatic
Deflection Method	Electrostatic
Overall Length	11-27/32" ± 3/8"
Greatest Diameter of Tube	3.30" ± 0.05"
Minimum Useful Storage-Surface Diameter	2-1/4"
Mounting Position	Any except those positions where the diheptal base is up and the tube axis is at an angle of less than 60° from the vertical.
Weight (Approx.)	1 lb

Base:

On large end of tube . . . . Small-Button Twentyninar 8-Pin (JETEC No.E8-19)

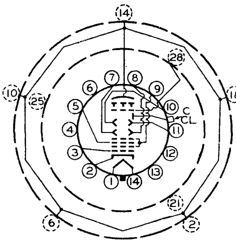
VIEW OF TWENTYNINAR-BASE END OF TUBE

Pin 2, Pin 6, Pin 10, Pin 14, Pin 18 — Multiple Connections to Backing-Electrode. Only One Need be Used

Pin 21 - No Connection

Pin 25 - No Connection

Pin 28 - Grid No.5



PINS 2,6,10,14,18: ON 1-7/8" DIA. PIN CIRCLE

PINS 21,25,28: ON 7/8" DIA. PIN CIRCLE

SOLID-LINE CIRCLES DEPICT DIHEPTAL BASE; BROKEN-LINE CIRCLES DEPICT TWENTYNINAR BASE

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On small end of tube. . . . . . Small-Shell Diheptal 14-Pin (JETEC No.B14-45)

VIEW OF DIHEPTAL-BASE END OF TUBE

Pin 1 - Heater
Pin 2 - Cathode
Pin 3 - Grid No.1
Pin 4 - Internal Connection-Do Not Use
Pin 5 - Grid No.3
Pin 6 - No Connection
Pin 7 - Deflecting Electrode DJ_4
Pin 8 - Deflecting Electrode DJ_3
Pin 9 - Ultor (Grids No.2 & No.4)
Pin 10 - Deflecting Electrode DJ_2
Pin 11 - Deflecting Electrode DJ_1
Pin 12 - No Connection
Pin 13 - Same as Pin 4
Pin 14 - Heater
C,CL - External Conductive Coating, Collector, Internal Shield, Flange between Neck and Large Part of Tube

All voltages are with respect to cathode unless otherwise specified

Maximum Ratings, *Absolute Values:*

BACKING-ELECTRODE-TO-GRID-No.5 (BARRIER-GRID) VOLTAGE:		
Backing-electrode positive with respect to grid No.5	100 max.	volts
Backing-electrode negative with respect to grid No.5	100 max.	volts
COLLECTOR-TO-GRID-No.5 VOLTAGE:		
Positive value	100 max.	volts
Negative value	0 max.	volts
ULTOR• VOLTAGE	1500 max.	volts
GRID-No.3 VOLTAGE.	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	200 max.	volts
Positive bias value.	0 max.	volts
Positive peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	10 max.	volts

Equipment Design Ranges:

*For any ultor voltage (E_{c_4}) between 1000 and 1500 volts**

Backing-Electrode-to-Grid-No.5 Voltage. . . . See Note 1

• The "ultor" in a storage tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 6499, the ultor function is performed by grid No.4. Since grid No.4 and grid No.2 are connected together within the 6499, they are collectively referred to simply as "ultor" for presenting data.

*: See next page.

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Collector-to-Grid-No.5 Voltage	0 to 50	volts
Grid-No.3 Voltage for Focus with grid-No.1 volts = 0	14% to 26% of E_{c_4}	volts
Grid-No.1 Voltage for collector-current cutoff	-2.5% to -4.7% of E_{c_4}	volts
Collector Current for grid-No.1 volts = 0. . .	20 to 50	μamp
Max. Cathode Current for grid-No.1 volts = 0.	*See Curve*	
Deflection Factors:		
DJ_1 and DJ_2.	85 to 105 v dc/in./kv of E_{c_4}	
DJ_3 and DJ_4.	78 to 96 v dc/in./kv of E_{c_4}	
Spot Position.	See Note 2	
Signal-Uniformity Ratio. .	See Note 3	

Examples of Use Design Ranges:

For ultor voltage of	*1000*	*volts*
Grid-No.3 Voltage for Focus with grid-No.1 volts = 0	140 to 260	volts
Grid-No.1 Voltage for collector-current cutoff	-25 to -47	volts
Deflection Factors:		
DJ_1 and DJ_2.	85 to 105	v dc/in.
DJ_3 and DJ_4.	78 to 96	v dc/in.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting-Electrode Circuit#	1.0 max.	megohm

* In general, the recommended minimum ultor voltage should not be less than 1000 volts. Signal output and resolution decrease with decreasing ultor voltage. Secondary emission characteristics of the dielectric layer limit the maximum ultor voltage to 1500 volts.

It is recommended that all deflecting-electrode-circuit resistances be approximately equal.

Note 1: The backing-electrode, grid No.5, and ultor are usually operated at the same dc potential. During the writing cycle, the backing-electrode may be pulsed to ±60 volts with respect to grid No.5.

Note 2: The undeflected focused spot will fall within a circle having a diameter equal to 10% of the minimum storage-surface diameter and having its center coincident with the center of the storage surface.

Spot position is calculated as follows: With heater voltage of 6.3 volts, ultor voltage of 1000 volts, grid-No.5 voltage of 1000 volts, collector voltage of 1050 volts, grid-No.3 voltage adjusted to give focus, grid-No.1 voltage adjusted for 15 microamperes peak collector current, each deflecting electrode connected through a 1-megohm resistor to ultor, and the tube shielded from all extraneous fields, the voltages

Note 3: See next page.

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required to displace the beam from its undeflected position to the edge of the storage surface in the direction of each deflecting electrode are recorded as *a* for DJ_1, *b* for DJ_2, *c* for DJ_3, and *d* for DJ_4.

Spot Position in % of Storage-Surface Diameter

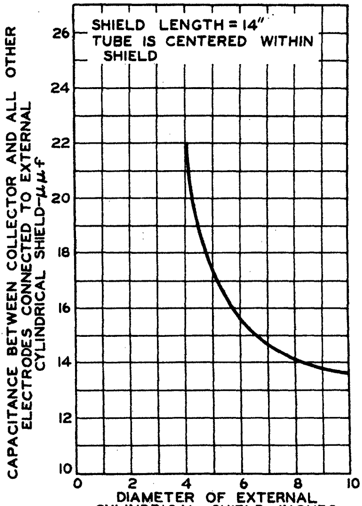
$$= 1/2\sqrt{\left(\frac{b-a}{b+a}\right)^2 + \left(\frac{d-c}{d+c}\right)^2} \times 100$$

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



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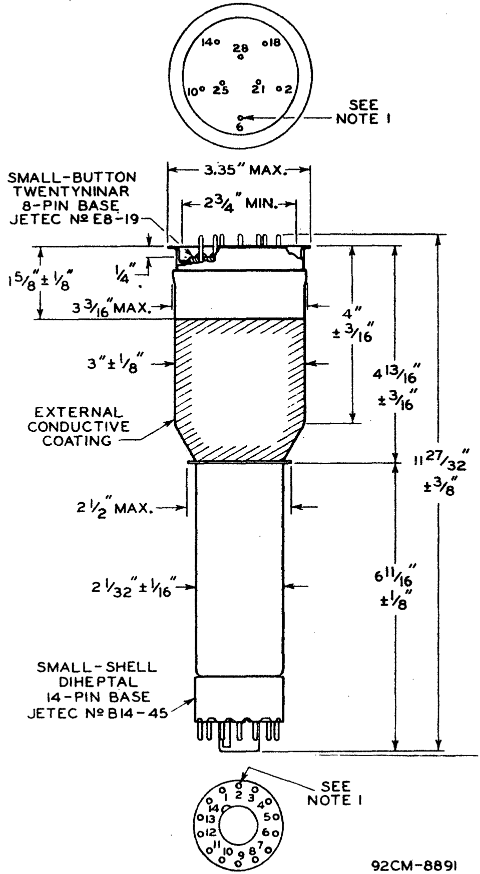

NOTE 1: THE ANGLE BETWEEN PLANE THROUGH PIN 6 OF TWENTYNINAR BASE AND TUBE AXIS, AND PLANE THROUGH PIN 2 OF DIHEPTAL BASE AND TUBE AXIS WILL NOT EXCEED 10°. THE INDICATED PINS ARE BOTH ON THE SAME SIDE OF THE TUBE.

NOTE 2: DEFLECTING ELECTRODES DJ_1 & DJ_2 ARE NEARER THE TARGET. DEFLECTING ELECTRODES DJ_3 & DJ_4 ARE NEARER THE DIHEPTAL BASE.

NOTE 3: ANGLE BETWEEN DJ_1 & DJ_2 DEFLECTION PATH AND DJ_3 & DJ_4 DEFLECTION PATH IS 90° ± 3°.

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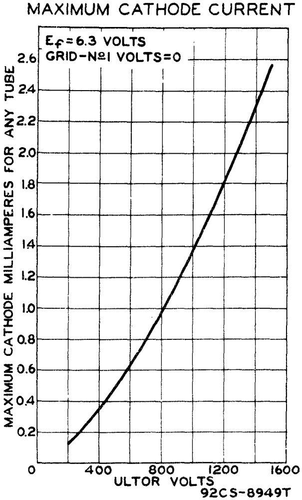

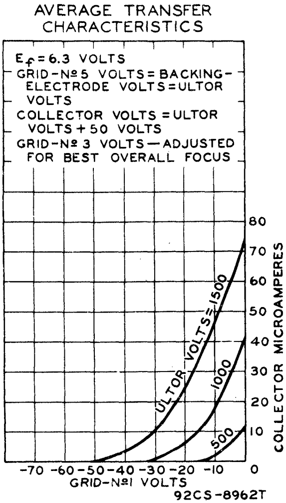

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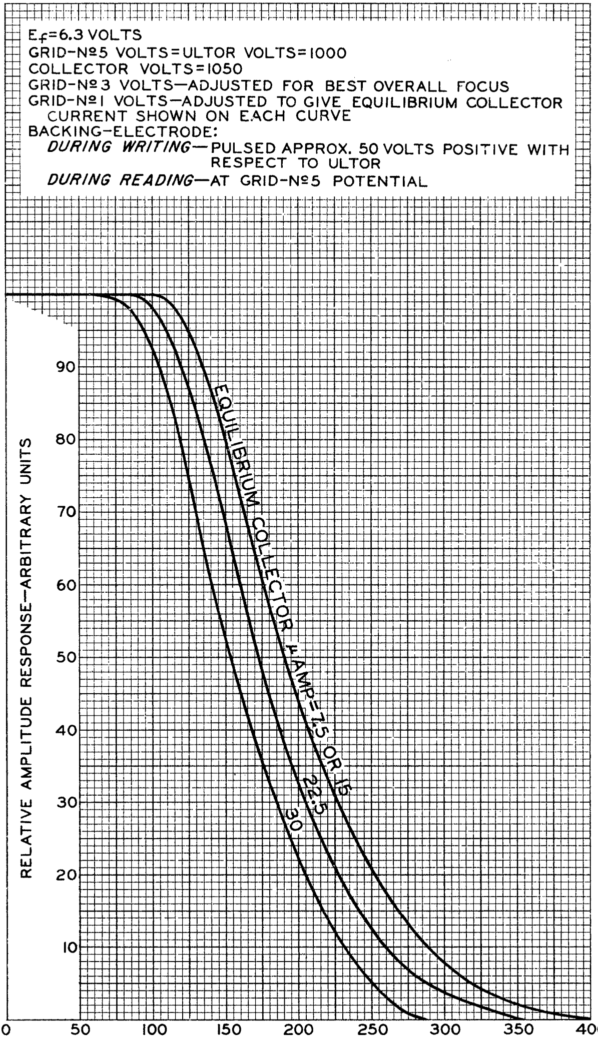
RESOLUTION CHARACTERISTICS



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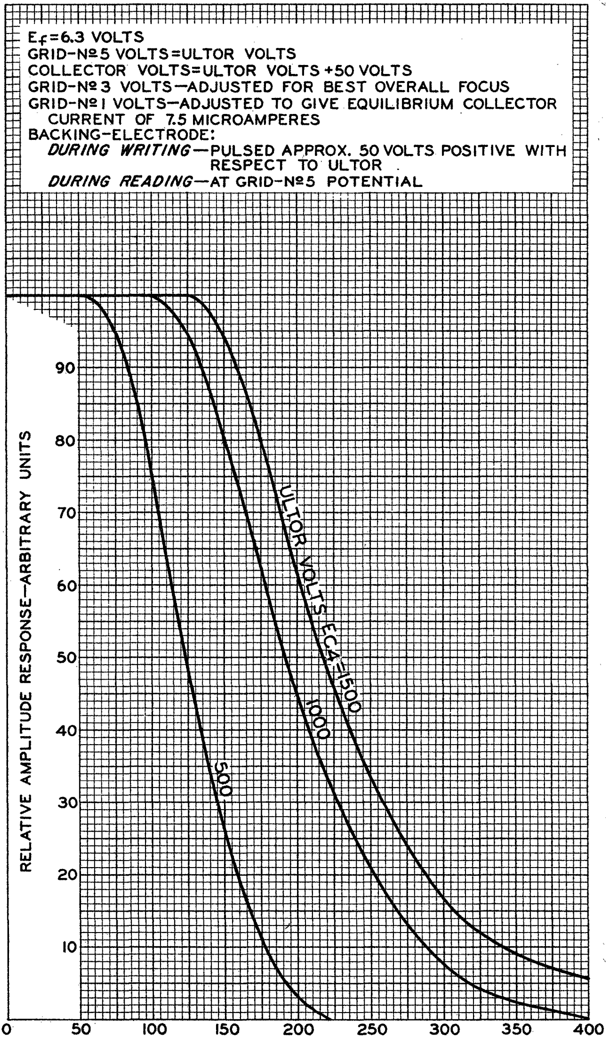
RESOLUTION CHARACTERISTICS



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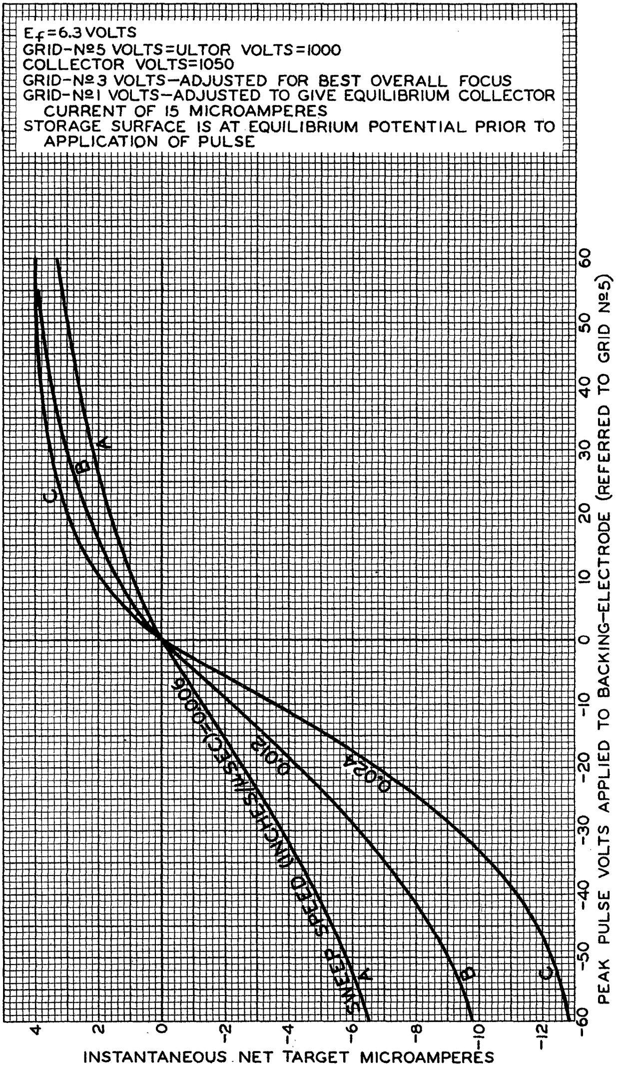
TYPICAL TARGET CHARACTERISTICS



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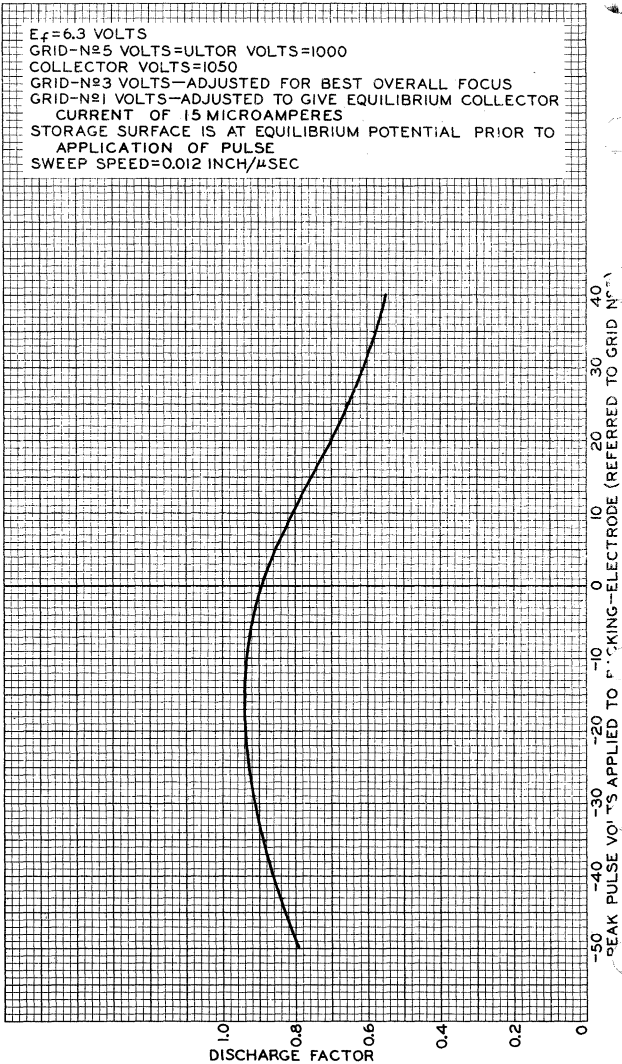
APPROXIMATE DISCHARGE-FACTOR CHARACTERISTIC



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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"

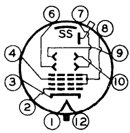
Weight (Approx.) . . . . . 9 oz

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 DJ_4
- Pin 7 – Deflecting Electrode DJ_3
- Pin 8 – Ultor (Grids No.2 & No.4)
- Pin 9 – Deflecting Electrode DJ_2
- Pin 10 – Deflecting Electrode DJ_1
- Pin 12 – Heater
- Cap – Collector
- SS – Storage Surface▲

▲ The Signal-Output Electrode is capacitively coupled to the Storage Surface.

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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_{c_4}) 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	μamp
Deflection Factors:		
DJ_1 & DJ_2	39 to 53	v dc/in./kv of E_{c4}
DJ_3 & DJ_4	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:			
DJ_1 & DJ_2	39 to 53	97.5 to 133	volts dc/in.
DJ_3 & DJ_4	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.

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COMPUTER STORAGE TUBE

Storage Characteristics for Ultor Voltage of 2500 Volts:

Storage-Surface Boundary (In terms of deflection voltage):		
In the $DJ_1 - DJ_2$ direction from position of undeflected focused beam . .	±109	volts
In the $DJ_3 - DJ_4$ 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 $DJ_1 - DJ_2$ or $DJ_3 - DJ_4$ 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

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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.

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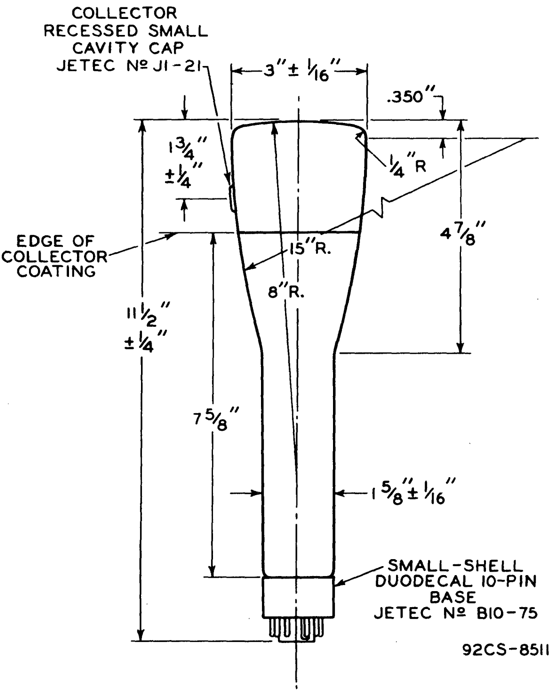
COMPUTER STORAGE TUBE



CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

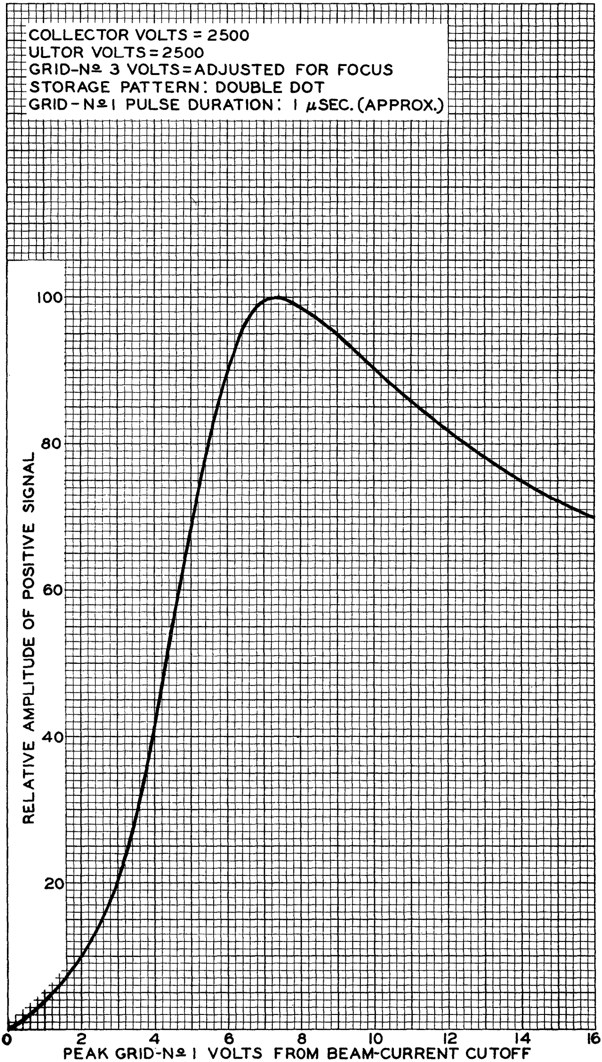
DJ_1 AND DJ_2 ARE NEARER THE STORAGE SURFACE: DJ_3 AND DJ_4 ARE NEARER THE BASE. WITH DJ_1 POSITIVE WITH RESPECT TO DJ_2, THE BEAM WILL BE DEFLECTED TOWARD PIN 2; LIKEWISE, WITH DJ_3 POSITIVE WITH RESPECT TO DJ_4, THE BEAM WILL BE DEFLECTED TOWARD VACANT PIN POSITION 11.

THE PLANE THROUGH TUBE AXIS AND EACH OF THE FOLLOWING ITEMS MAY VARY FROM THE DEFLECTION PATH PRODUCED BY DJ_1 AND DJ_2 BY THE FOLLOWING ANGULAR TOLERANCES (MEASURED ABOUT THE TUBE AXIS): PIN 2, 10°; SIDE TERMINAL (ON SAME SIDE AS PIN 8), 10°. ANGLE BETWEEN DJ_1-DJ_2 DEFLECTION PATH AND DJ_3-DJ_4 DEFLECTION PATH IS $90° \pm 3°$.

RCA

6571

AVERAGE CHARACTERISTIC



6472
MULTIPLIER PHOTOTUBE

9-STAGE TYPE WITH S-4 RESPONSE

For Headlight-Control Service

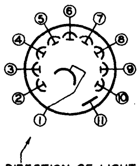
DATA

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 $\mu\mu$f
Anode to all other electrodes	5.5 $\mu\mu$f
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



DIRECTION OF LIGHT

Lead 7 – Dynode No.6
Lead 8 – Dynode No.7
Lead 9 – Dynode No.8
Lead 10 – Dynode No.9
Lead 11 – Anode

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°	0.1 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

* On plane perpendicular to the indicated direction of light (*See Dimensional Outline*).

° Averaged over any interval of 30 seconds maximum.

MAY 1, 1955 TENTATIVE DATA

6472
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	-	μamp/μwatt
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.

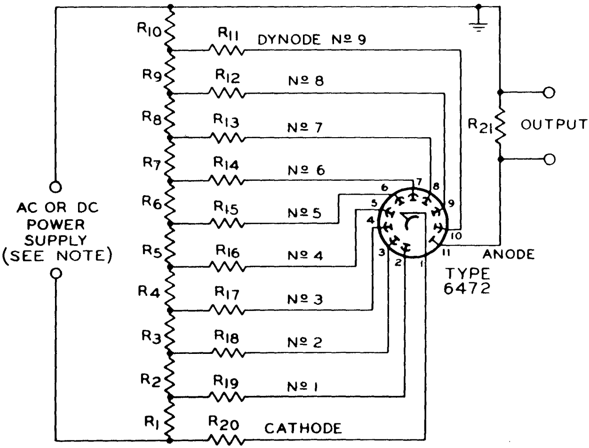
The use of an average anode current well below the maximum rated value of 0.1 milliampere is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 10 microamperes.

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

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.

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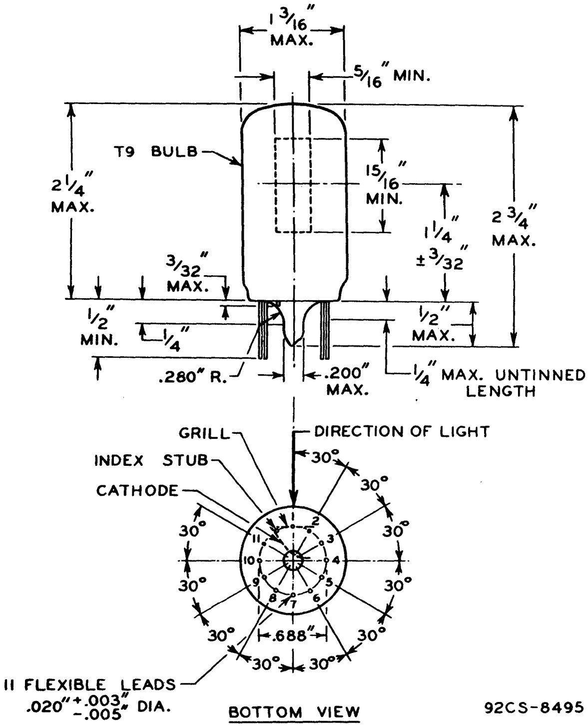
6472
MULTIPLIER PHOTOTUBE



THE ANGULAR VARIATION BETWEEN THE PLANE THROUGH LEAD No. 1 AND TUBE AXIS AND THE PLANE PERPENDICULAR TO THE PLANE OF THE GRILL WILL NOT EXCEED 20°.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-4 Response is shown at front of this Section

6472

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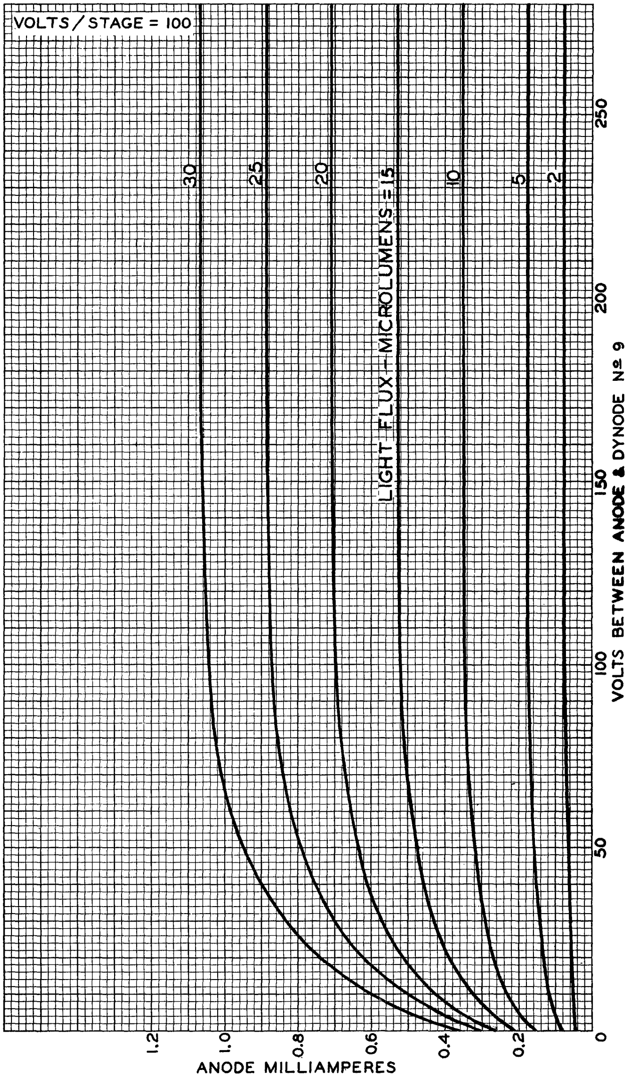
AVERAGE ANODE CHARACTERISTICS



JAN. 29, 1955

TUBE DIVISION
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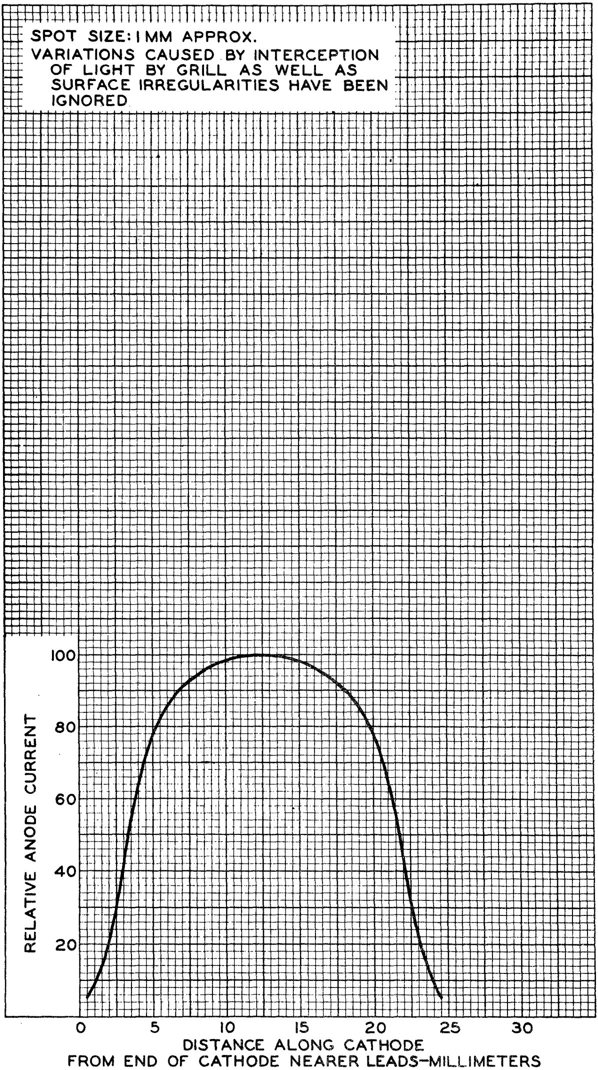
92CM - 8029R1

6472

6472

VARIATION IN SENSITIVITY OF PHOTOCATHODE ALONG ITS LENGTH



FEB.11,1955 TUBE DIVISION 92CM-8535

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

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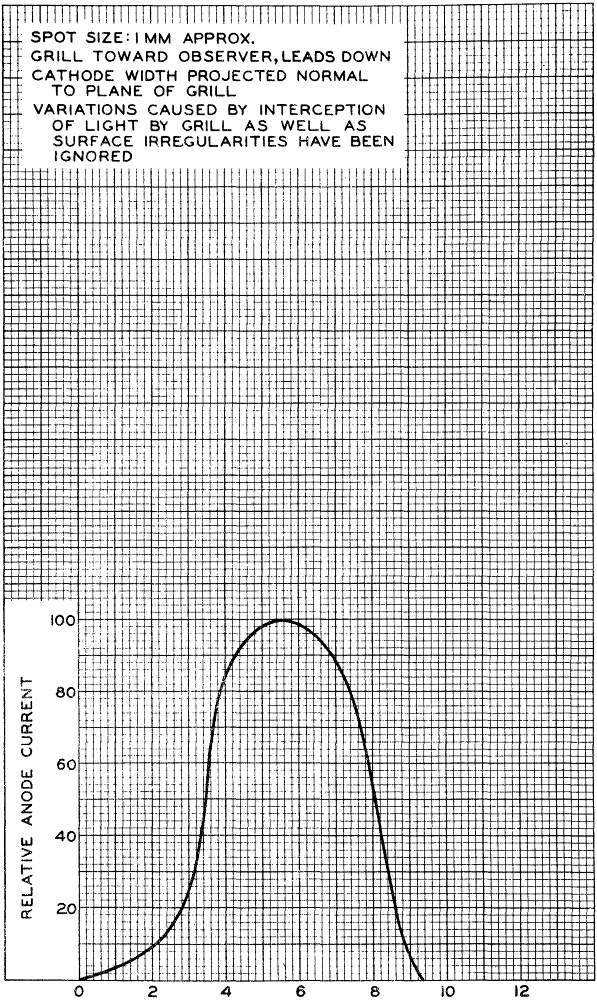
VARIATION IN SENSITIVITY OF PHOTOCATHODE ACROSS ITS PROJECTED WIDTH IN PLANE OF GRILL



FEB. 11, 1955

TUBE DIVISION

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92CM-8536

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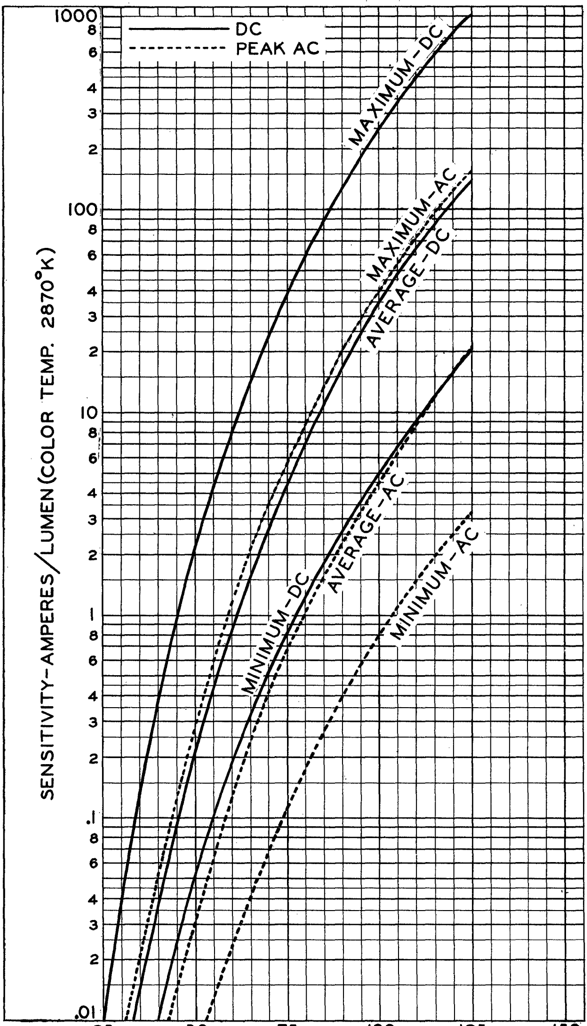
RANGE OF LUMINOUS SENSITIVITY



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.):°			
Grid No.1 to all other tube electrodes	6	18	μμf
Cathode to all other tube electrodes	4.2	6.5	μμf
Deflecting electrode DJ_1 to deflecting electrode DJ_2	1.8	–	μμf
Deflecting electrode DJ_3 to deflecting electrode DJ_4	1.8	–	μμf
DJ_1 to all other tube electrodes	7.5	–	μμf
DJ_2 to all other tube electrodes	8	–	μμf
DJ_3 to all other tube electrodes	6	–	μμf
DJ_4 to all other tube electrodes	7.	–	μμf
Focusing Method	Electrostatic	None	
Deflection Method	Electrostatic	None	
Deflecting-Electrode Arrangement	*See Dimensional Outline*	–	
Phosphor	–	High-Visual-Efficiency Type, Aluminized	
Fluorescence	–	Yellow	
Phosphorescence	–	Yellow	

Minimum Useful Screen Diameter . . . . . 4"
Maximum Overall Length . . . . . 15-1/2"
Seated Length . . . . . 14" ± 3/8"
Maximum Tube Radius . . . . . 3-5/32"
Bulb-Flange Diameter . . . . . 5-1/8" ± 1/16"
Greatest Bulb Diameter . . . . . 5" ± 1/16"
Bulb Terminals:
Caps (Two) . . . . . Recessed Small Cavity (JETEC No.J1-21)
Flange . . . . . *See Dimensional Outline*
Flexible cable . . . . . *See Dimensional Outline*
Ambient-Temperature Range . . . . . -65° to +100 °C
Mounting Position . . . . . Any
Weight (Approx.) . . . . . 2 lbs
Socket . . . . . Alden Part No.435SBA, or equivalent
Base . . . . . Small-Button Thirtyfivar 31-Pin (JETEC No.E31-36)

° Without external shield.

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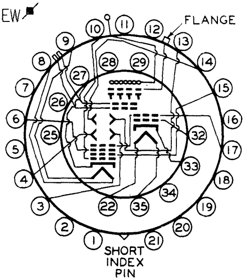
DISPLAY STORAGE TUBE

BOTTOM VIEW*



Pin 1 - No Connection
Pin 2 - Same as Pin 1
Pin 3 - Deflecting Electrode DJ_4 of Writing Gun
Pin 4 - Deflecting Electrode DJ_3 of Writing Gun
Pin 5 - Same as Pin 1
Pin 6 - Grid No.3 of Writing Gun
Pin 7 - Same as Pin 1
Pin 8 - Heater of Writing Gun
Pin 9 - Heater of Writing Gun
Pin 10 - Grid No.1 of Writing Gun
Pin 11 - Same as Pin 1
Pin 12 - Same as Pin 1
Pin 13 - Deflecting Electrode DJ_1 of Writing Gun
Pin 14 - Deflecting Electrode DJ_2 of Writing Gun
Pin 15 - Grid No.2 of Writing Gun
Pin 16 - Internal Connection-Do Not Use
Pin 17 - Grid No.4 of Writing Gun, Grid No.2 of Viewing Gun
Pin 18 - Same as Pin 1
Pin 19 - Same as Pin 1
Pin 20 - Same as Pin 16
Pin 21 - Same as Pin 1
Pin 22 - Heater of Viewing Gun
Pin 25 - Same as Pin 1
Pin 26 - Same as Pin 1
Pin 27 - Cathode of Writing Gun
Pin 28 - Same as Pin 1
Pin 29 - Same as Pin 1
Pin 32 - Grid No.1 of Viewing Gun
Pin 33 - Cathode of Viewing Gun
Pin 34 - Same as Pin 1
Pin 35 - Heater of Viewing Gun
Flexible Cable - Connection to Screen
Flange - Backing-Electrode
Recessed Cavity Cap -
Nearer Tube Face--Grid No.4 of Viewing Gun
Nearer Electron Guns--Grid No.3 of Viewing Gun

Maximum Ratings, *Absolute Values:*

	Writing Section	Viewing Section**	
SCREEN VOLTAGE	–	11000 max.	volts
PEAK BACKING-ELECTRODE VOLTAGE.	–	20 max	volts

* Pins 23 and 31 are not shown because they are trimmed to the same dimension as the short index pin and are not to be used.

**: See next page.

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DISPLAY STORAGE TUBE

	Writing Section	Writing Section, Equivalent Values	Viewing Section**	
GRID-No.4 VOLTAGE	2900 max.*	150 max.**	300 max.	volts
GRID-No.3 VOLTAGE	1000 max.*	–	300 max.	volts
GRID-No.2 VOLTAGE	2750 max.*	–	150 max.	volts
CATHODE VOLTAGE	–	-2900 max.**	–	volts
GRID-No.1 VOLTAGE:				
Negative bias value . .	200 max.*		100 max.	volts
Positive bias value . .	0 max.*		0 max.	volts
Positive peak value . .	2 max.*		0 max.	volts
PEAK VOLTAGE BETWEEN GRID No.4 AND ANY DEFLECTING ELECTRODE. .	500 max.		–	volts
PEAK HEATER-CATHODE VOLTAGE:				
Heater negative with respect to cathode. .	125 max.*		125 max.	volts
Heater positive with respect to cathode. .	125 max.*		125 max.	volts

VIEWING SECTION**

Operating Values and Typical Performance Characteristics:

Screen Voltage	5000	10000	10000	volts
DC Backing-Electrode Voltage	5	5	5	volts
Grid-No.4 Voltage	150	210	150	volts
Grid-No.3 Voltage#.	25 to 125	50 to 150	25 to 125	volts
Grid-No.2 Voltage†#	50 to 75	70 to 105	50 to 75	volts
Grid-No.1 Voltage#.	0 to -50	0 to -75	0 to -50	volts
Maximum Screen Current. . .	350	600	350	µamp
Maximum Peak Backing-Electrode Current	1.5	2	1.5	ma
Maximum Grid-No.4 Current♁.	2	3	2	ma
Maximum Grid-No.3 Current♁.	1.5	2	1.5	ma
Maximum Cathode Current♁. .	3	4	3	ma
Writing Speed††	300000	300000	300000	in./sec
Number of Half-Tone Steps□ .	5	5	5	
Viewing Duration▲	40	20	40	sec
Maximum Erasing-Uniformity Factor□□.	0.5	0.5	0.5	
Resolution✠.	50	50	50	lines/in.
Brightness♁♁.	275	2750	1500	fl ←

** Voltages are shown with respect to cathode of Viewing Gun.

Adjusted for brightest, most uniform pattern.

† Grid No.2 of the Viewing Gun is connected internally to grid No.4 of the Writing Gun.

♁ For conditions with combined adjustment of grid-No.1 voltage, grid-No.2 voltage, and grid-No.3 voltage to give brightest, most uniform pattern.

*, ††, □, ▲, □□, ✠, ♁♁: See next page. ← Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

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DISPLAY STORAGE TUBE

WRITING SECTION●

Range Values for Equipment Design:*

With any grid-No.2 voltage (E_{c_2}) between 500 and 2750 volts

Grid-No.4 Voltage (E_{c_4})	95% to 105% of E_{c_2}	volts
Grid-No.3 Voltage for Focus	14% to 28% of E_{c_2}	volts
Maximum Grid-No.1 Voltage for Cutoff of Undeflected Focused Spot.	−4.6% of E_{c_2}	volts
Maximum Grid-No.3 Current	−15 to +10	μamp
Maximum Cathode Current	*See Curve*	
Deflection Factors:		
DJ_1 and DJ_2	28 to 38	v dc/in./kv of E_{c_4}
DJ_3 and DJ_4	28 to 38	v dc/in./kv of E_{c_4}
Focused Beam Position	##	

Examples of Use of Design Ranges:*

With grid-No.2 voltage of	*1500*	*2500*	*volts*
Grid-No.4 Voltage (E_{c_4})	1425 to 1575	2375 to 2625	volts
Grid-No.3 Voltage for Focus . .	210 to 420	350 to 700	volts
Maximum Grid-No.1 Voltage for Cutoff of Undeflected Focused Spot.	−69	−115	volts
Deflection Factors when $E_{c_4} = E_{c_2}$:			
DJ_1 and DJ_2	42 to 57	70 to 95	v dc/in.
DJ_3 and DJ_4	42 to 57	70 to 95	v dc/in.

Equivalent Values for Examples of Writing-Gun Voltages Referred to Cathode of Viewing Gun:

Cathode Voltage	−1450 to −1395	−2450 to −2395	volts
Grid-No.2 Voltage	−25 to +180	−75 to +230	volts
Grid-No.3 Voltage for Focus . .	−1240 to −975	−2100 to −1695	volts
Grid-No.4 Voltage	50 to 105	50 to 105	volts

VIEWING SECTION and WRITING SECTION

Circuit Values:

Grid-No.1-Circuit Resistance (Either gun)	1.0 max.	megohm
Resistance in Any Deflecting-Electrode Circuit■ . . .	0.1 max.	megohm
Backing-Electrode-Circuit Resistance.	0.005 max.	megohm
Series Current-Limiting Resistance in Screen Circuit.	1.0 min.	megohm

* Voltages are shown with respect to cathode of Writing Gun.

†† Measured under conditions of writing from just zero brightness (viewing-beam cutoff) to maximum brightness with grid No.1 of Writing Gun at −10 volts with respect to cathode of Writing Gun, and grids No.2 and No.4 of Writing Gun at +2500 volts with respect to cathode of Writing Gun.

□ Observed with an RCA-2F21 Monoscope display.

▲, □□, ⊕, ♣♣, ●, ##, ■: See next page.

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DISPLAY STORAGE TUBE

▲ Expressed in terms of the time required for the brightness of the unwritten background to rise from just zero brightness (viewing-beam cutoff) to 10% of the maximum brightness.

□□ Defined as $(t_2 - t_1)/t_2$, where

t_1 = time measured from start of erasing to instant at which any screen area is reduced to zero brightness.

t_2 = time measured from start of erasing to instant at which entire screen area is reduced to zero brightness.

卐 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.

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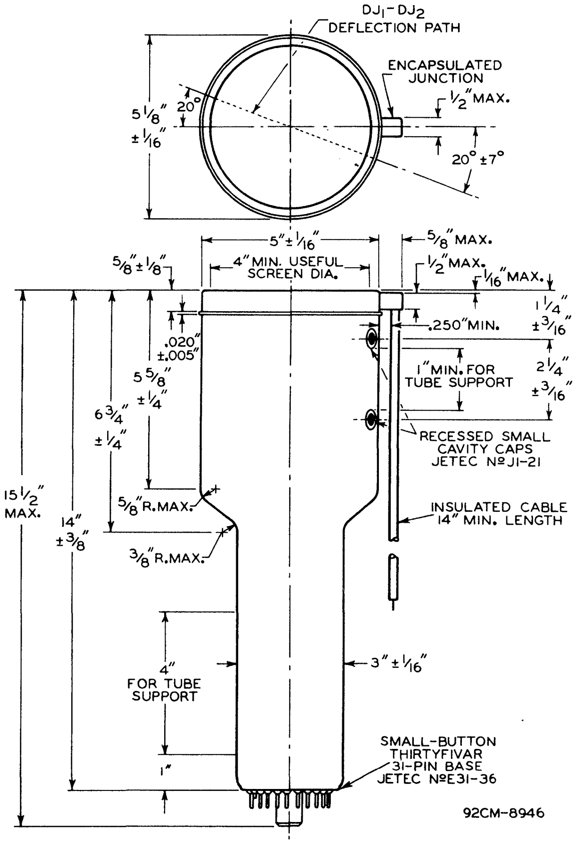
DISPLAY STORAGE TUBE



CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 3° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF FACEPLATE.

THE PLANE THROUGH TUBE AXIS AND EACH OF THE FOLLOWING ITEMS MAY VARY FROM THE DEFLECTION PATH PRODUCED BY DJ_1 AND DJ_2 BY THE FOLLOWING ANGULAR TOLERANCES (MEASURED ABOUT THE TUBE AXIS): PIN 27, ± 10°; EACH CAVITY CAP (ON SAME SIDE AS PIN 27), ± 17°; ENCAPSULATED JUNCTION, + 10°. ANGLE BETWEEN DJ_1 – DJ_2 DEFLECTION PATH AND DJ_3 – DJ_4 DEFLECTION PATH IS 90° ± 3°.

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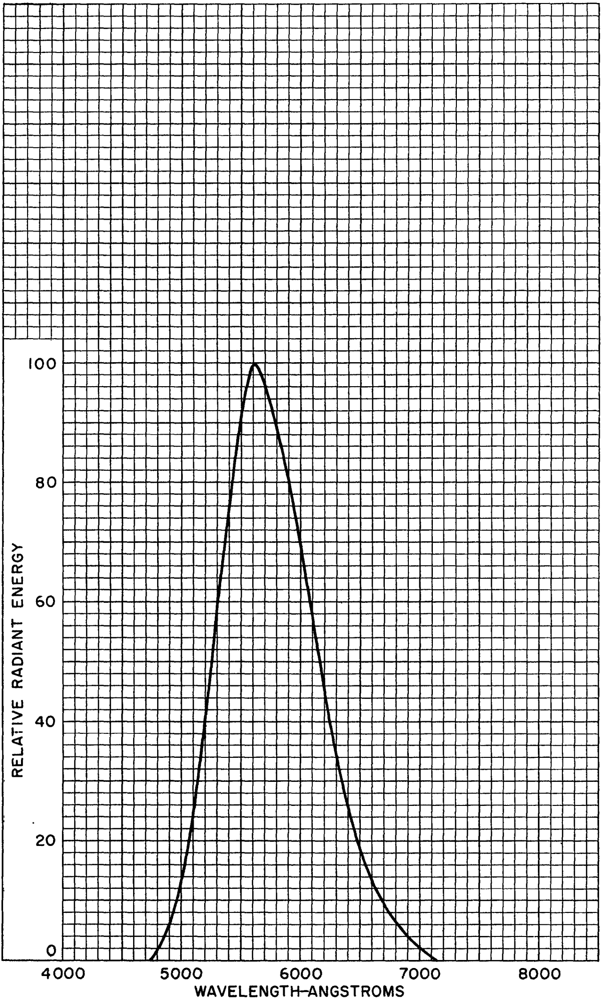
SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR



6866

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AVERAGE CHARACTERISTIC

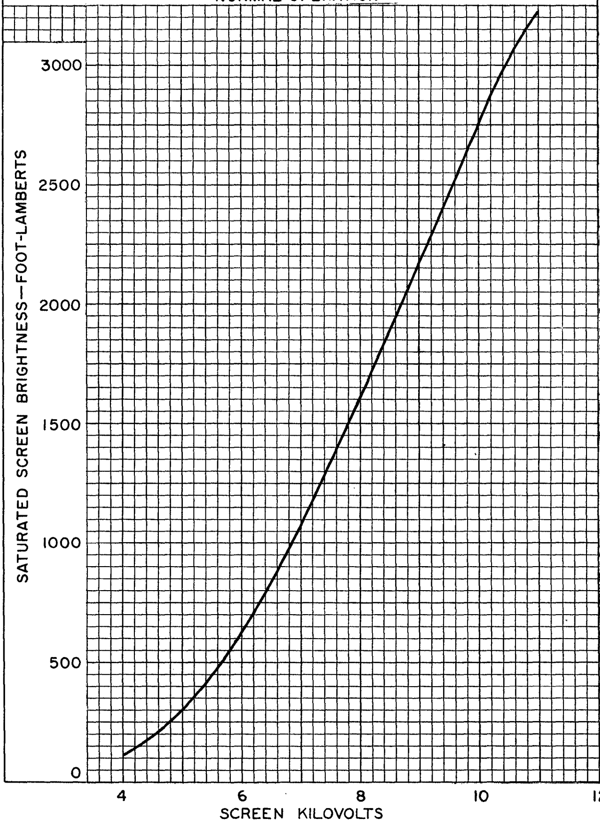
VIEWING SECTION

E_f = 6.3 VOLTS
BACKING-ELECTRODE VOLTS* = 5
GRID-No 4 VOLTS* = 210
GRID-No 2 VOLTS* = 85
GRID-No 3 VOLTS* } ADJUSTED FOR BRIGHTEST,
GRID-No 1 VOLTS* } MOST UNIFORM DISPLAY.

*REFERRED TO CATHODE OF VIEWING GUN.

WRITING SECTION

NORMAL OPERATION



ELECTRON TUBE DIVISION
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92CM-9043R1

RCA

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AVERAGE CHARACTERISTICS

VIEWING SECTION

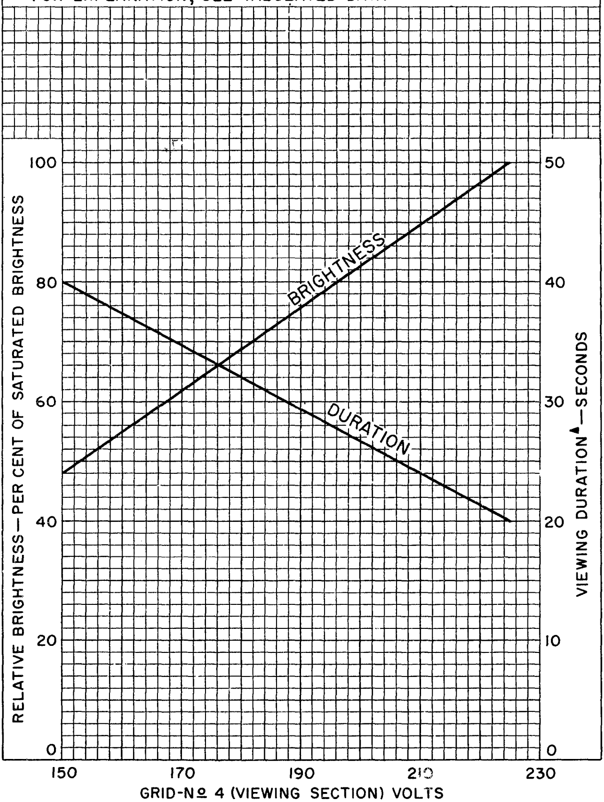
E_f = 6.3 VOLTS
SCREEN KILOVOLTS* = 5 TO 10
BACKING-ELECTRODE VOLTS* = 5
GRID-No 2 VOLTS* = 85
GRID-No 3 VOLTS* } ADJUSTED FOR BRIGHTEST,
GRID-No 1 VOLTS* } MOST UNIFORM DISPLAY

*REFERRED TO CATHODE OF VIEWING GUN

WRITING SECTION

NORMAL OPERATION

▲FOR EXPLANATION, SEE TABULATED DATA



92CM-9044

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TYPICAL ERASURE CHARACTERISTICS

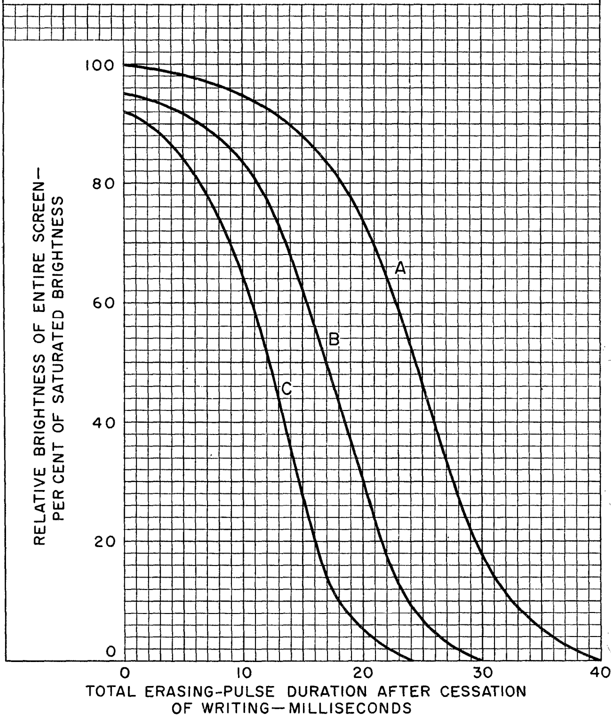
VIEWING SECTION

E_f=6.3 VOLTS
GRID-No 4 VOLTS*=210
GRID-No 3 VOLTS* } ADJUSTED FOR BRIGHTEST,
GRID-No 1 VOLTS* } MOST UNIFORM DISPLAY
SCREEN KILOVOLTS*=10
GRID-No 2 VOLTS*=85

*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.



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CURRENT CHARACTERISTIC
FOR WRITING GUN

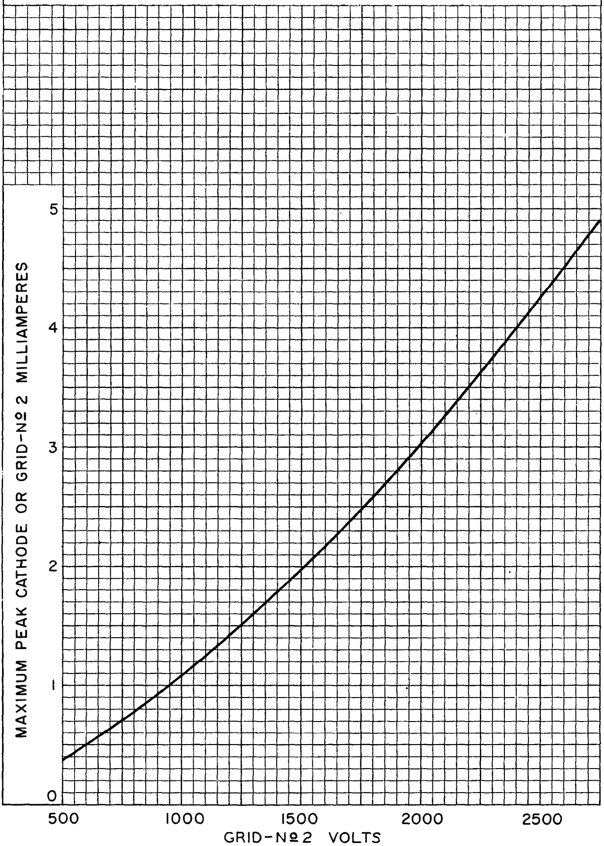
WRITING SECTION

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

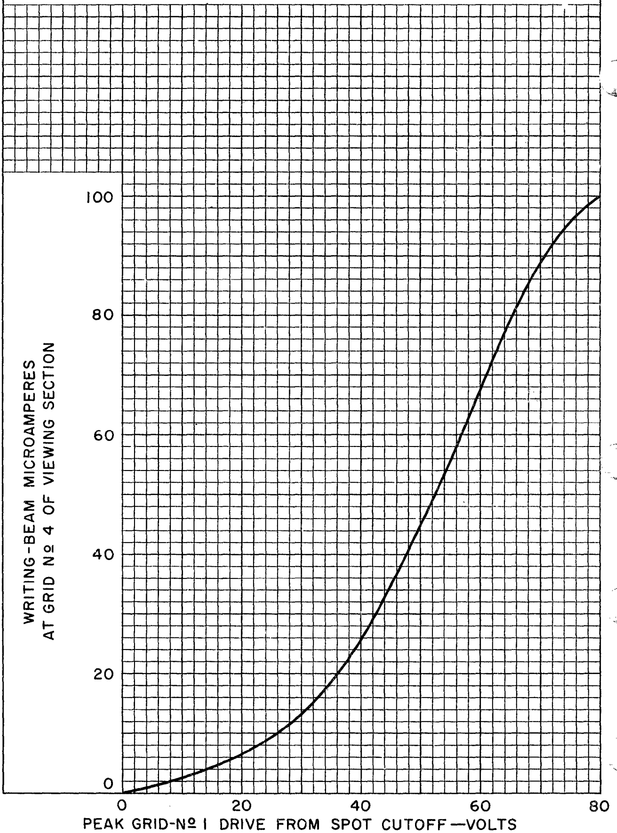
TYPICAL DRIVE CHARACTERISTIC
FOR WRITING GUN

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

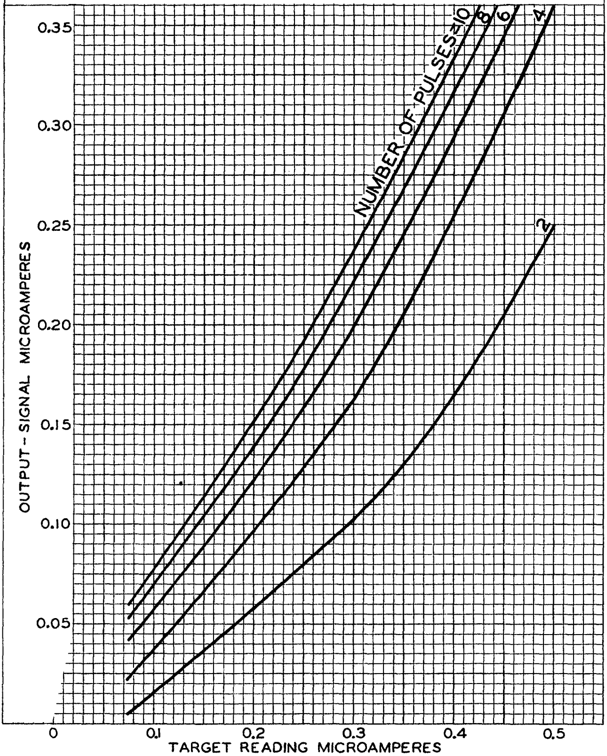


6896/1855

OPERATION CHARACTERISTICS

E_f = 6.3 VOLTS—EACH GUN
BACKING-ELECTRODE-TO-GRID-No 4 VOLTS = -10
SHADING-ELECTRODE-TO-GRID-No 4 VOLTS = +20

	Writing Gun	*Reading Gun*
GRID-No 4 VOLTS TO GROUND . .	0	0
GRID-No 3 VOLTS	ADJUSTED FOR FOCUS	ADJUSTED FOR FOCUS
GRID-No 2 VOLTS TO GROUND . .	-8750	0
GRID-No 1 VOLTS	ADJUSTED TO CUTOFF	VARIED TO GIVE TARGET µA AS SHOWN
CATHODE VOLTS TO GROUND . . .	-9000	-1000
GRID-No 1 PEAK PULSE VOLTS FROM BEAM-CURRENT CUTOFF	12.5	-
SCANNING:	PPI	TV
RATE (REV/SEC)	0	-
SWEEP PRF (PPS)	1000	-
SWEEP TIME (µSEC/RADIUS)	100	-
INPUT SIGNAL, RECTANGULAR PULSE:		
DURATION (µSEC)	1	-
REPETITION RATE (PPS)	1000	-
NUMBER OF PULSES	AS SHOWN	-



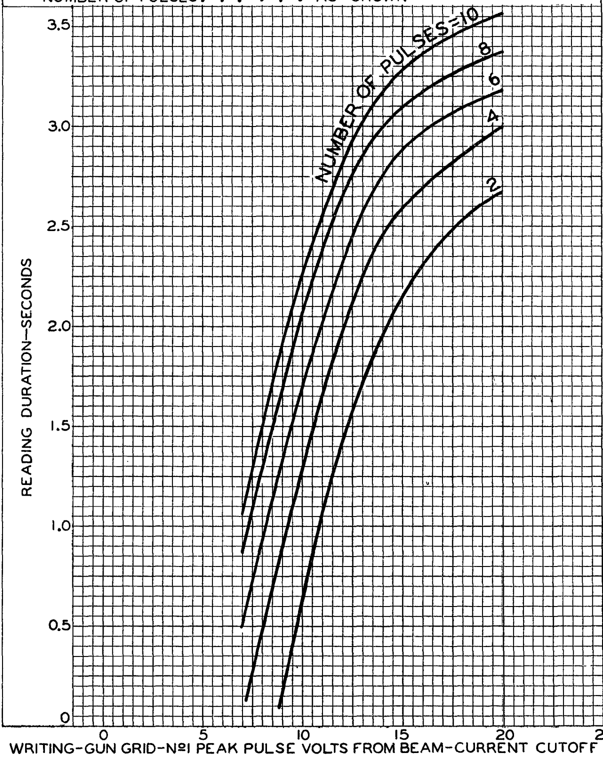
6896

6896/1855

OPERATION CHARACTERISTICS

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	ADJUSTED TO GIVE TARGET μA=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 (μSEC/RADIUS)	100	—
INPUT SIGNAL, RECTANGULAR PULSE:		
DURATION (μSEC)	1	—
REPETITION RATE (PPS)	1000	—
NUMBER OF PULSES	AS SHOWN	—



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-9411

6896

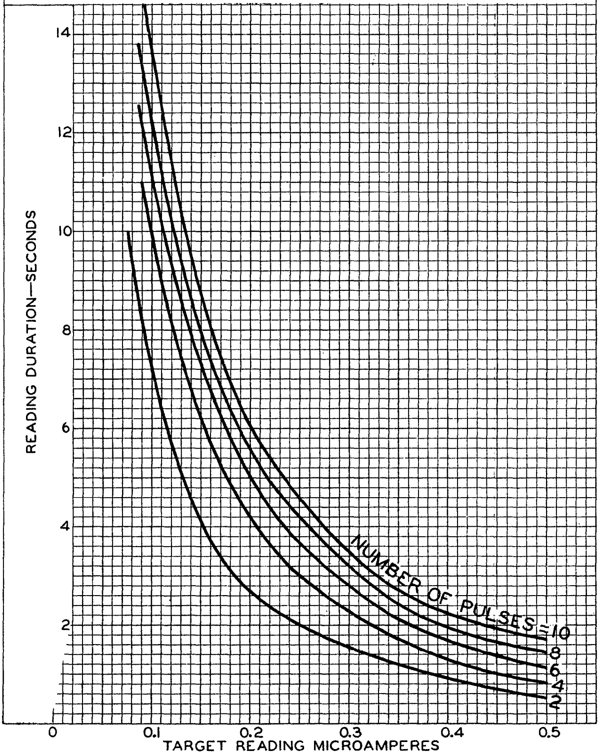
RCA

6896/1855

OPERATION CHARACTERISTICS

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 μA 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(μSEC/RADIUS). . .	100	—
INPUT SIGNAL, RECTANGULAR PULSE:		
DURATION (μSEC).	1	—
REPETITION RATE (PPS)	1000	—
NUMBER OF PULSES	AS SHOWN	—



7183

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.):°			
Grid No.1 to all other tube electrodes. . .	7	7.5	μμf
Cathode to all other tube electrodes. . .	5	5	μμf
Backplate to all other tube electrodes. . .	–	300	μμf
Focusing Method.	Electrostatic	None	
Deflection Method. . . .	Magnetic	None	
Deflection Angle	♦	–	
Phosphor	–	P20, Aluminized	
Fluorescence	–	Yellow-Green	
Phosphorescence. . . .	–	Yellow-Green	

Minimum Useful Screen Diameter . . . . 4"
Maximum Overall Length . . . . 11.62"
Seated Length. . . . . 11.16" ± 0.10"
Maximum Tube Radius. . . . . 3.00"
Maximum Tube Diameter. . . . . 5.19"
Greatest Bulb Diameter . . . . 5.00" ± 0.06"
Ambient-Temperature Range. . . . . -65^{o} to $+100^{o}$ C
Operating Position . . . . Any
Weight (Approx.) . . . . 1-3/4 lbs
Terminal Connectors. . . . .*See Operating Considerations*
Bulb Terminals:
Caps (Three) . . . . .Recessed Small Cavity (JETEC No.J1-21)
Flexible leads (Two) . . . . *See Dimensional Outline*
Base:
Writing gun. . . . . . . Small-Button Neoditetrar 8-Pin (JETEC No.E8-49)
Viewing gun. . . . . .Small-Button Miniature 7-Pin (JETEC No.E7-1)

°,♦: See next page.

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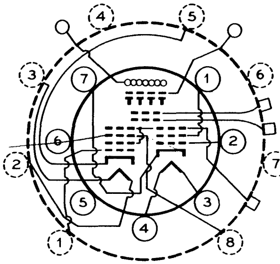
DISPLAY STORAGE TUBE

BOTTOM VIEW



SOLID-LINE CIRCLES DEPICT
MINIATURE 7-PIN BASE
BROKEN-LINE CIRCLES DEPICT
NEODITETRAR 8-PIN BASE

WRITING SECTION▲

Small-Button Neoditetrar 8-Pin Base

Pin 1 - Grid No. 1
Pin 2 - Heater
Pin 3 - Heater
Pin 4 - Internal Connection — Do Not Use
Pin 5 - Cathode
Pin 6 - Internal Connection — Do Not Use
Pin 7 - No Connection
Pin 8 - Grid No. 3

VIEWING SECTION

Small-Button Miniature 7-Pin Base

Pin 1 - Grid No. 2
Pin 2 - Grid No. 1
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Internal Connection — Do Not Use
Pin 6 - No Connection
Pin 7 - Cathode

Flexible Lead (Large) - Screen
Flexible Lead (Small) - Backplate
Recessed Cavity Cap:
Located 1-1/4" from Tube Face - Grid No. 5
Located 3" from Tube Face - Grid No. 4
Located Near Viewing Gun - Grid No. 3, Grids No. 4 & No. 2 of Writing Gun

Maximum Ratings, ***Absolute Values:***

	Writing Section	Viewing Section	
SCREEN VOLTAGE .	-	10000 max.**	volts
PEAK BACKPLATE VOLTAGE. . . .	-	30 max.**	volts

o,♦,▲,**: See next page.

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DISPLAY STORAGE TUBE

	Writing Section *Equivalent Values*		Viewing Section *Equivalent Values*		
GRID-No.5 VOLTAGE. . . .	–	–	–	300 max.**	volts
GRID-No.4 VOLTAGE. . . .	2900 max.*▲	150 max.**	–	150 max.**	volts
GRID-No.3 VOLTAGE. . . .	1200 max.*	–	2900 max.*▲	150 max.**	volts
GRID-No.2 VOLTAGE. . . .	2900 max.*▲	150 max.**	–	150 max.**	volts
CATHODE VOLTAGE.	–	-2750 max.**	–	–	volts
GRID-No.1 VOLTAGE:					
Negative-bias value. . . .	200 max.*		100 max.**		volts
Positive-bias value. . . .	0 max.*		0 max.**		volts
Positive-peak value. . . .	2 max.*		0 max.**		volts
PEAK HEATER-CATHODE VOLTAGE:					
Heater negative with respect to cathode. . .	125 max.*		125 max.**		volts
Heater positive with respect to cathode. . .	125 max.*		125 max.**		volts

VIEWING SECTION**

Operating Values and Typical Performance Characteristics:

To prevent possible damage to the tube, allow the viewing-gun beam current to reach normal operating value before turning on the writing-gun beam current, and keep the viewing beam on till the writing beam is turned off

Screen Voltage	8500	volts
DC Backplate Voltage	0	volts
Grid-No.5 Voltage#	220 to 250	volts
Grid-No.4 Voltage#	40 to 100	volts
Grid-No.3 Voltage#▲.	10 to 40**	volts
	2510 to 2540*	volts
Grid-No.2 Voltage#	100	volts
Grid-No.1 Voltage#	0 to -75	volts
Maximum Screen Current	0.6	ma
Maximum Peak Backplate Current	2	ma
Maximum Grid-No.5 Current●	2.4	ma

o,♦,▲,**,*,#,●: See next page.

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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

o Without external shield.

♦ *See accompanying drawing CE-9578 showing angles of deflection.*

▲ Grids No.4 & No.2 of Writing Gun are connected together and to grid No.3 of Viewing Gun within the tube.

** Voltages are shown with respect to cathode of Viewing Gun.

* Voltages are shown with respect to cathode of Writing Gun.

Adjusted for brightest, most uniform pattern.

♠ For conditions with combined adjustment of grid-No.1 voltage, grid-No.2 voltage, grid-No.3 voltage, and grid-No.4 voltage to give brightest, most uniform pattern. After final adjustment, the grid-No.1 voltage should not be more positive than –20 volts to maintain electrode current within the maximum value indicated.

□ Observed with an RCA-2F21 Monoscope display.

▲▲ Expressed in terms of the time required for the brightness of the unwritten background to rise from just zero brightness (viewing-beam cutoff) to 10% of saturated brightness.

□□, ✠, ♠♠, ●: See next page.

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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.

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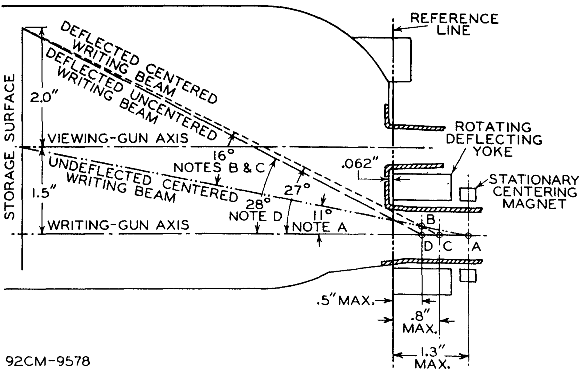
DISPLAY STORAGE TUBE

ANGLES OF DEFLECTION AND CENTERS OF DEFLECTION FOR WRITING GUN WHEN USED WITH ROTATING 2-COIL YOKE AND STATIONARY 4-COIL YOKE



92CM-9578

NOTE A: CENTERING OF THE WRITING BEAM ON THE STORAGE SURFACE IS NECESSARY FOR A CENTERED PPI DISPLAY. THE BEAM IS CENTERED BY SHIFTING IT FROM THE WRITING-GUN AXIS THROUGH AN ANGLE OF 11° WITH A CENTERING MAGNET WHOSE EFFECTIVE CENTER (A) IS LOCATED 1.3" FROM REFERENCE LINE.

NOTE B: WITH ROTATING YOKE WHOSE EFFECTIVE CENTER OF DEFLECTION (B) IS LOCATED 0.5" FROM REFERENCE LINE, THE CENTERED WRITING BEAM (NOTE A) MUST BE DEFLECTED THROUGH AN ANGLE OF 32° TO SWEEP FULLY THE STORAGE SURFACE.

NOTE C: WITH STATIONARY TV-TYPE YOKE WHOSE EFFECTIVE CENTER OF DEFLECTION (C) IS LOCATED 0.8" FROM REFERENCE LINE, THE CENTERED WRITING BEAM MUST BE DEFLECTED THROUGH AN ANGLE OF 32° TO SWEEP FULLY THE STORAGE SURFACE.

NOTE D: WHEN ROTATING YOKE IS USED WITH UNCENTERED DISPLAY, i.e., THE WRITING BEAM IS NOT CENTERED (NOTE A) BUT STRIKES THE STORAGE SURFACE ON THE WRITING-GUN AXIS, AND WITH THE EFFECTIVE CENTER OF DEFLECTION OF THE ROTATING YOKE LOCATED 0.5" FROM THE REFERENCE LINE, THE UNCENTERED WRITING BEAM MUST BE DEFLECTED THROUGH AN ANGLE OF 56° TO SWEEP FULLY THE STORAGE SURFACE.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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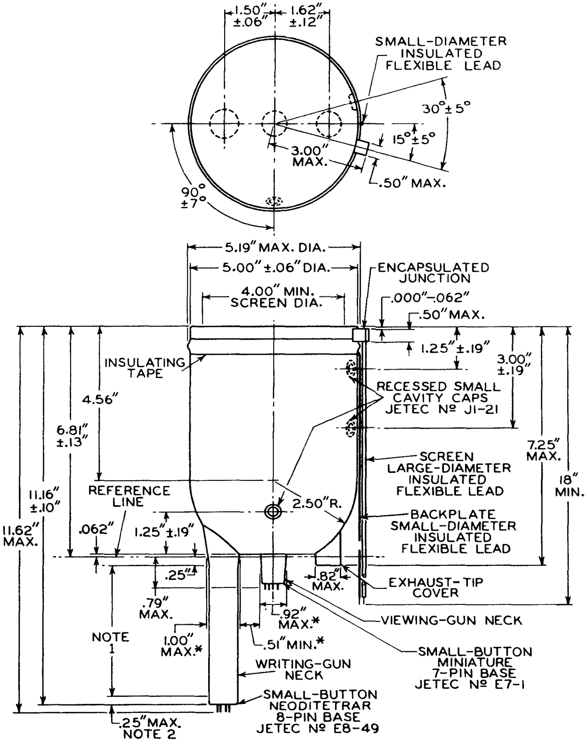
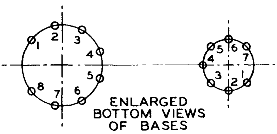
DISPLAY STORAGE TUBE



*AT REFERENCE LINE
NOTE 1: WITHIN THIS DISTANCE, NECK DIAMETER IS .920" MAX.
NOTE 2: WITHIN THIS DISTANCE, NECK DIAMETER IS .950" MAX.



ENLARGED BOTTOM VIEWS OF BASES

92CM-9580

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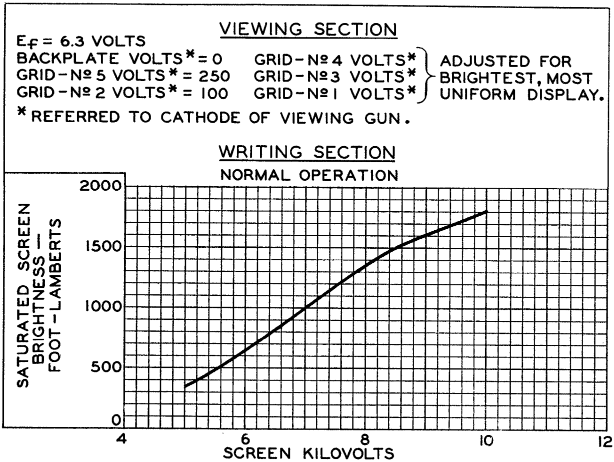
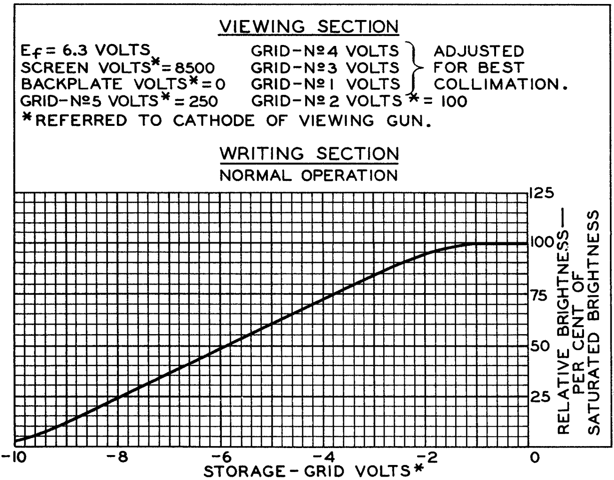
7183

TYPICAL CHARACTERISTIC



92CS-9553

TYPICAL STORAGE-GRID CHARACTERISTIC



92CS-9554

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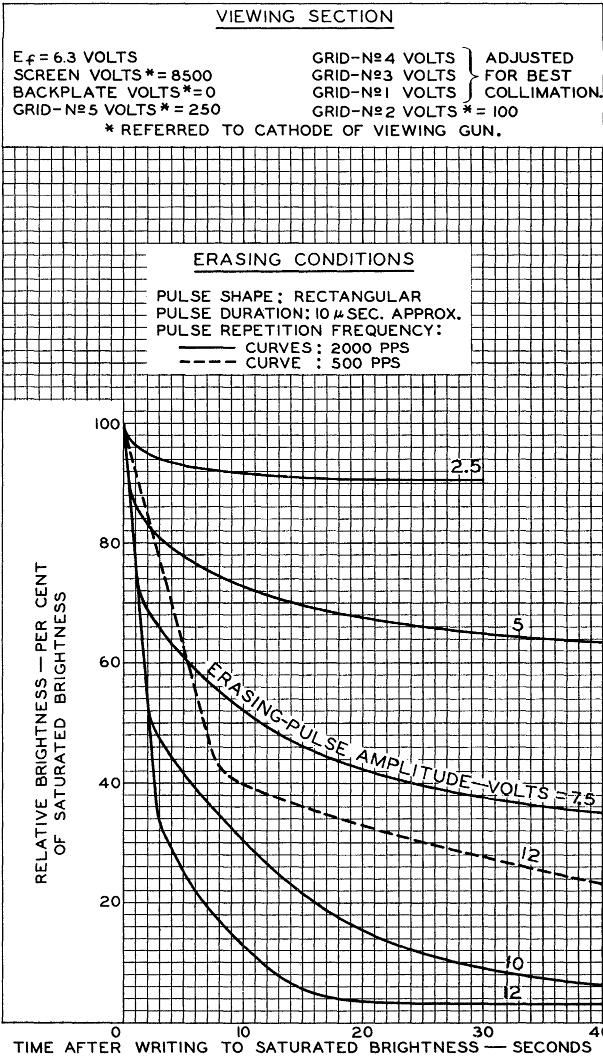
TYPICAL ERASURE CHARACTERISTICS



7315

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DISPLAY STORAGE TUBE

DIRECT-VIEW TYPE
3.8"-DIAMETER DISPLAY

WRITING GUN:	VIEWING GUN:
ELECTROSTATIC DEFLECTION	NO DEFLECTION
ELECTROSTATIC FOCUS	NO FOCUS

DATA

General:

	Writing Section	Viewing Section	
Heater, for Unipotential Cathode:			
Voltage (AC or DC)	6.3	6.3	volts
Current	0.6	0.6	amp
Minimum Cathode Heating Time before other electrode voltages are applied	–	30	sec
Direct Interelectrode Capacitances (Approx.):[o]			
Grid No.1 to all other tube electrodes	6.5	11	$\mu\mu$f
Cathode to all other tube electrodes	5.5	8	$\mu\mu$f
Backplate to all other tube electrodes	–	116	$\mu\mu$f
Deflecting electrode DJ_1 to deflecting electrode DJ_2	1.9	–	$\mu\mu$f
Deflecting electrode DJ_3 to deflecting electrode DJ_4	2	–	$\mu\mu$f
DJ_1 to all other tube electrodes	6	–	$\mu\mu$f
DJ_2 to all other tube electrodes	7	–	$\mu\mu$f
DJ_3 to all other tube electrodes	5.5	–	$\mu\mu$f
DJ_4 to all other tube electrodes	4.8	–	$\mu\mu$f
Focusing Method	Electrostatic	None	
Deflection Method	Electrostatic	None	
Deflecting-Electrode Arrangement	*See Dimensional Outline*	–	
Phosphor (For Curves, see front of this Section)	–	P20, Aluminized	
Fluorescence	–	Yellow-Green	
Phosphorescence	–	Yellow-Green	

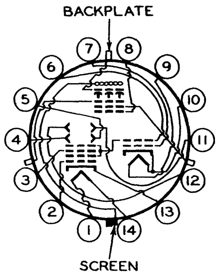
Minimum Useful Viewing Diameter♥	3.8"
Maximum Overall Length	13.64"
Seated Length	12.50" ± 0.39"
Greatest Bulb Diameter	5.25" ± 0.06"
Maximum Tube Radius	2.69"
Bulb Terminals:	
Caps (Three)	Recessed Small Ball (JEDEC No.J1-22)
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Temperature Range:	
Operating	-65° to +100° C
Storage	-55° to +85° C
Operating Position	Any
Weight (Approx.)	2-3/4 lbs
Base	Medium-Shell Diheptal 14-Pin (JEDEC Group 5, No.B14-38)

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
	Equivalent Values		*Equivalent Values*		
GRID-No. 5 VOLTAGE	–	–	–	300 max.**	volts
GRID-No. 4 VOLTAGE	2950 max.*▲	200 max.**	–	300 max.**	volts
GRID-No. 3 VOLTAGE	1200 max.*	–1550 max.**	–	200 max.** 10 min.**	volts
PEAK VOLTAGE BETWEEN GRID No. 3 AND GRIDS No. 2 & No. 4.	–	2950 max.	–	–	volts

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DISPLAY STORAGE TUBE

	Writing Section		Viewing Section		
GRID-No.2 VOLTAGE	2950 max.*▲	200 max.**	2950 max.*▲	200 max.**	volts
CATHODE VOLTAGE	–	-2750 max.**	–	–	volts
GRID-No.1 VOLTAGE:					
Negative-bias value . . .	200 max.*		200 max.**		volts
Positive-bias value . . .	0 max.*		0 max.**		volts
Positive-peak value . . .	2 max.*		0 max.**		volts
PEAK VOLTAGE BETWEEN GRIDS No.2 & No.4 AND ANY DEFLECTING ELECTRODE . .	500 max.		–		volts
PEAK HEATER-CATHODE VOLTAGE:					
Heater negative with respect to cathode . .	125 max.*		–		volts
Heater positive with respect to cathode . .	125 max.*		–		volts

VIEWING SECTION**

Operating Values and Typical Performance Characteristics:

To prevent possible damage to the tube, allow the viewing-gun beam current to reach normal operating value before turning on the writing-gun beam current, and keep the viewing-gun beam on till the writing beam is turned off

Screen Voltage.	10000	10000	volts
Backplate Voltage (DC).	2	2	volts
Grid-No.5 Voltage	210	150	volts
Grid-No.4 Voltage#.	50 to 150	30 to 90	volts
Grid-No.3 Voltage#.	10 to 50	10 to 40	volts
Grid-No.2 Voltage▲.	150	125	volts
Grid-No.1 Voltage#.	0 to -80	0 to -60	volts
Maximum Screen Current.	0.75	0.5	ma
Maximum Backplate Current (Peak). . . .	2	1.5	ma
Maximum Grid-No.5 Current	3	2.5	ma
Maximum Grid-No.4 Current	3	2.5	ma
Maximum Grid-No.3 Current	5	4	ma

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DISPLAY STORAGE TUBE

Maximum Grid-No.2 Current.	3	2.5	ma
Maximum Cathode Current.	8	6.5	ma
Number of Half-Tone Steps□	5	5	
Viewing Duration▲▲	20	40	sec
Maximum Erasing-Uniformity Factor□□. . .	0.45	0.4	
Resolution✠.	50	50	lines/in.
Brightness♣♣	2750	1500	fl

WRITING SECTION•

Range Values for Equipment Design:*

For any grids-No.2 & No.4 voltage ($E_{c_{2+4}}$) between 1500 and 2750 volts▲

Grid-No.3 Voltage for focus.	17.5% to 37.5% of $E_{c_{2+4}}$	volts
Maximum Grid-No.1 Voltage for cutoff of undeflected focused spot	−4.6% of $E_{c_{2+4}}$	volts
Maximum Grid-No.3 Current.	−15 to +10	μa
Maximum Cathode Current.	*See Curve*	
Deflection Factors:		
DJ_1 & DJ_2.	36 to 48	v dc/in./kv of $E_{c_{2+4}}$
DJ_3 & DJ_4.	35 to 47	v dc/in./kv of $E_{c_{2+4}}$
Focused Beam Position. .	##	
Writing Speed††.	3000	in./sec

Examples of Use of Design Ranges:*

For grids-No.2 & No.4 voltage ($E_{c_{2+4}}$)▲	*2000*	*volts*
Grid-No.3 Voltage for focus.	350 to 750	volts
Maximum Grid-No.1 Voltage for cutoff of undeflected focused spot.	−92	volts
Deflection Factors:		
DJ_1 & DJ_2.	72 to 96	volts
DJ_3 & DJ_4.	70 to 94	volts

Equivalent Values of Writing-Gun Voltages Referred to Cathode of Viewing Gun:

Cathode Voltage.	−1875	−1850	volts
Grid-No.3 Voltage for focus.	−1125 to −1525	−1100 to −1500	volts
Grids-No.2 & No.4 Voltage▲ .	+125	+150	volts

VIEWING SECTION and WRITING SECTION

Circuit Values:

Grid-No.1-Circuit Resistance (Either gun).	1 max.	megohm
Resistance in Any Deflecting-Electrode Circuit■. .	0.1 max.	megohm
Series Current-Limiting Resistor (Unbypassed) in Grid-No.5 (Viewing-Section) Circuit	0.01 min.	megohm

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA
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.

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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.

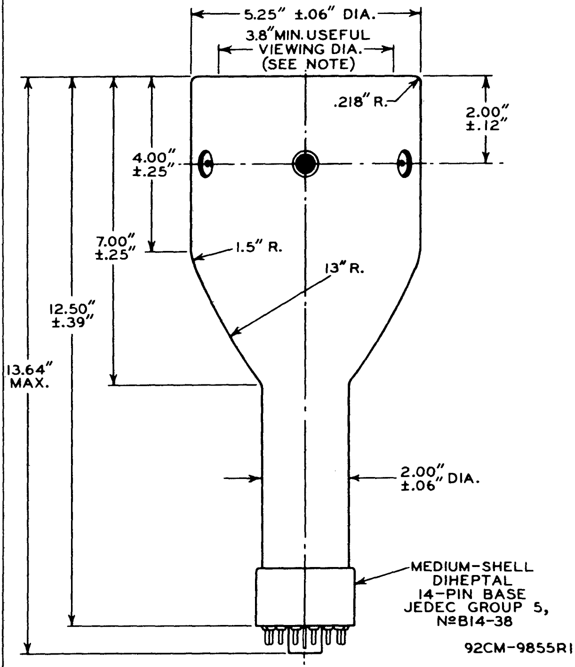
To prevent possible damage to the tube, allow the Viewing-Gun beam current to reach normal operating value before turning on the Writing-Gun beam current, and keep the viewing beam on till the writing beam is turned off.

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.

RCA

7315

DISPLAY STORAGE TUBE



ELECTRON TUBE DIVISION
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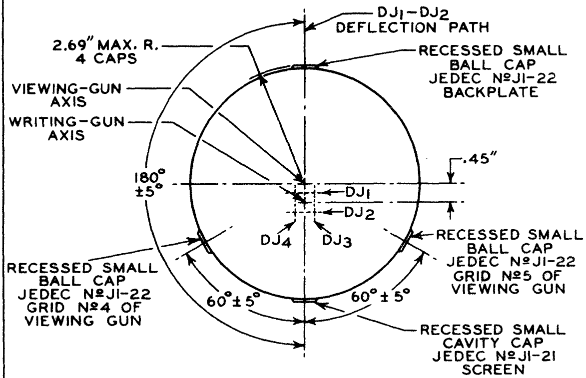
DISPLAY STORAGE TUBE

TOP VIEW



NOTE: MINIMUM USEFUL VIEWING AREA MAY BE ECCENTRIC WITH RESPECT TO THE TUBE FACE. THE MINIMUM USEFUL VIEWING AREA WILL HAVE DIAMETER OF 3.8".

CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

DEFLECTING ELECTRODES DJ_1 AND DJ_2 ARE NEARER THE SCREEN; DEFLECTING ELECTRODES DJ_3 AND DJ_4 ARE NEARER THE BASE. WITH DJ_1 POSITIVE WITH RESPECT TO DJ_2, THE SPOT WILL BE DEFLECTED TOWARD PIN 8; LIKEWISE, WITH DJ_3 POSITIVE WITH RESPECT TO DJ_4, THE SPOT WILL BE DEFLECTED TOWARD PIN 4.

THE ANGLE BETWEEN THE DEFLECTION PATH PRODUCED BY DJ_1 AND DJ_2 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND THE BASE KEY BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. ANGLE BETWEEN DJ_1 – DJ_2 DEFLECTION PATH AND DJ_3 – DJ_4 DEFLECTION PATH IS 90° ± 3°.

THE ANGLE BETWEEN THE DEFLECTION PATH PRODUCED BY DJ_1 AND DJ_2 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND THE SCREEN CAP BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°.

7315

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TYPICAL CHARACTERISTICS

VIEWING SECTION

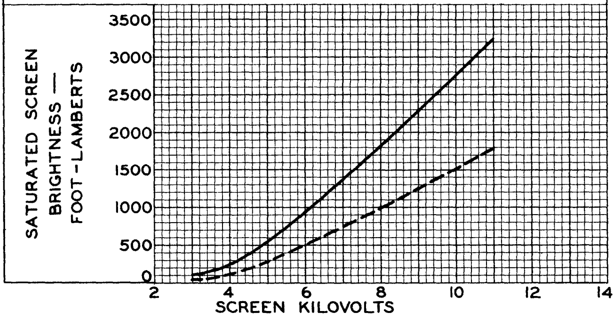
E_f = 6.3 VOLTS
BACKPLATE VOLTS* = 2

GRID-No 4 VOLTS*
GRID-No 3 VOLTS*
GRID-No 1 VOLTS*
} ADJUSTED FOR BRIGHTEST, MOST UNIFORM DISPLAY.

——— GRID-No 5 VOLTS* = 210; GRID-No 2 VOLTS* = 150
- - - - - GRID-No 5 VOLTS* = 150; GRID-No 2 VOLTS* = 125

* REFERRED TO CATHODE OF VIEWING GUN.

WRITING SECTION
NORMAL OPERATION



92CS-9858

TYPICAL STORAGE-GRID CHARACTERISTIC

VIEWING SECTION

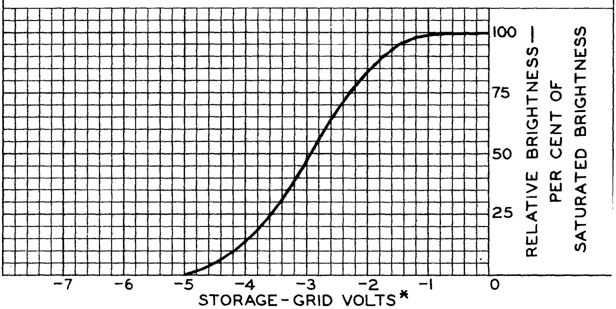
E_f = 6.3 VOLTS
SCREEN VOLTS* = 10000
BACKPLATE VOLTS* = 2
GRID-No 5 VOLTS* = 150

GRID-No 4 VOLTS
GRID-No 3 VOLTS
GRID-No 1 VOLTS
} ADJUSTED FOR BEST COLLIMATION.

GRID-No 2 VOLTS* = 125

* REFERRED TO CATHODE OF VIEWING GUN.

WRITING SECTION
NORMAL OPERATION



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92CS-9861

7315

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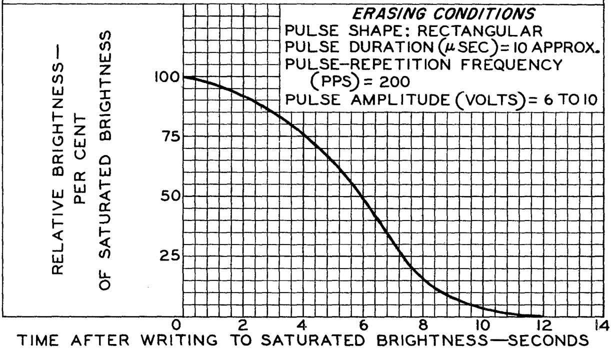
TYPICAL ERASURE CHARACTERISTIC

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 } ADJUSTED FOR BEST COLLIMATION.
GRID-№2 VOLTS* = 125

* REFERRED TO CATHODE OF VIEWING GUN.



92CS-9860

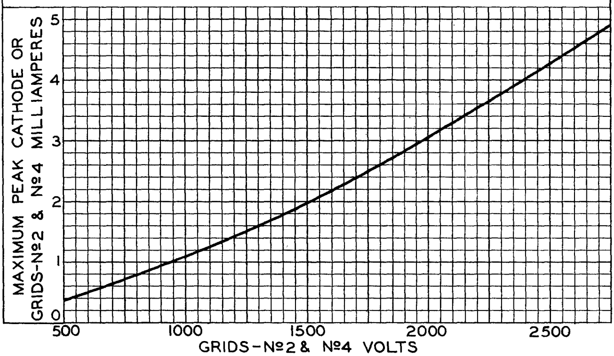
WRITING-GUN-CURRENT CHARACTERISTIC

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
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92CS-9859

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DISPLAY STORAGE TUBE

DIRECT-VIEW TYPE
3.8"-DIAMETER DISPLAY

WRITING GUN:
ELECTROSTATIC DEFLECTION
ELECTROSTATIC FOCUS

VIEWING GUN:
NO DEFLECTION
NO FOCUS

DATA

General:

	Writing Section	Viewing Section	
Heater, for Unipotential Cathode:			
Voltage (AC or DC)	6.3	6.3	volts
Current	0.6	0.6	amp
Minimum Cathode Heating Time before other electrode voltages are applied.	–	30	sec
Direct Interelectrode Capacitances (Approx.):°			
Grid No.1 to all other tube electrodes	6.5	11	μμf
Cathode to all other tube electrodes	5.5	8	μμf
Backplate to all other tube electrodes	–	116	μμf
Deflecting electrode DJ_1 to deflecting electrode DJ_2. . .	1.9	–	μμf
Deflecting electrode DJ_3 to deflecting electrode DJ_4. . .	2	–	μμf
DJ_1 to all other tube electrodes.	6	–	μμf
DJ_2 to all other tube electrodes.	7	–	μμf
DJ_3 to all other tube electrodes.	5.5	–	μμf
DJ_4 to all other tube electrodes.	4.8	–	μμf
Focusing Method	Electrostatic	None	
Deflection Method	Electrostatic	None	
Deflecting-Electrode Arrangement.	*See Dimensional Outline*	–	
Phosphor (For Curves, see front of this Section).	–	P20, Aluminized	
Fluorescence.	–	Yellow-Green	
Phosphorescence	–	Yellow-Green	

Minimum Useful Viewing Diameter♥. . . . . 3.8"
Maximum Overall Length. . . . . 13.64"
Seated Length . . . . 12.50" ± 0.39"
Greatest Bulb Diameter. . . . . 5.25" ± 0.06"
Maximum Tube Radius . . . . 2.69"
Bulb Terminals:
Caps (Three). . . . . Recessed Small Ball (JEDEC No.J1-22)
Cap . . . . Recessed Small Cavity (JEDEC No.J1-21)
Temperature Range:
Operating . . . . −55° to +85° C
Storage . . . . −65° to +100° C
Operating Position. . . . . .Any
Weight (Approx.). . . . . 2-3/4 lbs
Base. . . . . . . .Medium-Shell Diheptal 14-Pin (JEDEC Group 5, No.B14-38)

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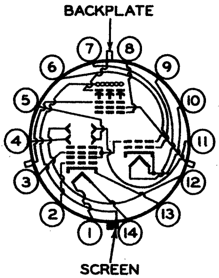
DISPLAY STORAGE TUBE

BOTTOM VIEW



Pin 1—Heater of Writing Gun
Pin 2—Grid No.1 of Writing Gun
Pin 3—Grid No.3 of Writing Gun
Pin 4—Deflecting Electrode DJ_3 of Writing Gun
Pin 5—Deflecting Electrode DJ_4 of Writing Gun
Pin 6—Grid No.2 of Viewing Gun, Grid No.2 and Grid No.4 of Writing Gun
Pin 7—Grid No.1 of Viewing Gun
Pin 8—Grid No.3 of Viewing Gun
Pin 9—Heater of Viewing Gun
Pin 10—Heater and Cathode of Viewing Gun
Pin 11—Deflecting Electrode DJ_1 of Writing Gun
Pin 12—Deflecting Electrode DJ_2 of Writing Gun
Pin 13—Cathode of Writing Gun
Pin 14—Heater of Writing Gun

Recessed Ball Cap:
Over Pin 3—Grid No.5 of Viewing Gun
Over Pin 12—Grid No.4 of Viewing Gun
On Side of Tube Opposite Base Key—Backplate

Recessed Cavity Cap:
Over Base Key—Screen

Maximum and Minimum Ratings, ***Absolute-Maximum Values:***

For altitudes up to 10,000 feet

	Writing Section		Viewing Section		
SCREEN VOLTAGE.	–			11000 max.**	volts
BACKPLATE VOLTAGE (Peak). .	–			20 max.**	volts
	Equivalent Values		*Equivalent Values*		
GRID-No.5 VOLTAGE	–	–	–	300 max.**	volts
GRID-No.4 VOLTAGE	2950 max.*▲	200 max.**	–	300 max.**	volts
GRID-No.3 VOLTAGE	1200 max.*	–1550 max.**	–	200 max.** / 10 min.**	volts
PEAK VOLTAGE BETWEEN GRID No.3 AND GRIDS No.2 & No.4.	–	2950 max.	–	–	volts

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DISPLAY STORAGE TUBE

	Writing Section		Viewing Section		
GRID-No.2 VOLTAGE	2950 max.*▲	200 max.**	2950 max.*▲	200 max.**	volts
CATHODE VOLTAGE	–	–2750 max.**	–	–	volts
GRID-No.1 VOLTAGE:					
Negative-bias value . . .	200 max.*		200 max.**		volts
Positive-bias value . . .	0 max.*		0 max.**		volts
Positive-peak value . . .	2 max.*		0 max.**		volts
PEAK VOLTAGE BETWEEN GRIDS No.2 & No.4 AND ANY DEFLECTING ELECTRODE . .	500 max.		–		volts
PEAK HEATER-CATHODE VOLTAGE:					
Heater negative with respect to cathode . .	125 max.*		–		volts
Heater positive with respect to cathode . .	125 max.*		–		volts

VIEWING SECTION**

Operating Values and Typical Performance Characteristics:

To prevent possible damage to the tube, allow the viewing-gun beam current to reach normal operating value before turning on the writing-gun beam current, and keep the viewing-gun beam on till the writing beam is turned off

Screen Voltage.	10000	10000	volts
Backplate Voltage (DC).	2	2	volts
Grid-No.5 Voltage	210	150	volts
Grid-No.4 Voltage#.	50 to 150	30 to 90	volts
Grid-No.3 Voltage#.	10 to 50	10 to 40	volts
Grid-No.2 Voltage▲.	150	125	volts
Grid-No.1 Voltage#.	0 to –80	0 to –60	volts
Maximum Screen Current.	0.75	0.5	ma
Maximum Backplate Current (Peak). . . .	2	1.5	ma
Maximum Grid-No.5 Current	3	2.5	ma
Maximum Grid-No.4 Current	3	2.5	ma
Maximum Grid-No.3 Current	5	4	ma

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DISPLAY STORAGE TUBE

Maximum Grid-No.2 Current■	3	2.5	ma
Maximum Cathode Current.	8	6.5	ma
Number of Half-Tone Steps□	5	5	
Viewing Duration▲▲	20	40	sec
Maximum Erasing-Uniformity Factor□□. . . .	0.45	0.4	
Resolution✠	50	50	lines/in.
Brightness●●	2750	1500	fl

WRITING SECTION●

Range Values for Equipment Design:*

For any grids-No.2 & No.4 voltage ($E_{c_{2+4}}$) between 1500 and 2750 volts▲

Grid-No.3 Voltage for focus.	17.5% to 37.5% of $E_{c_{2+4}}$		volts
Maximum Grid-No.1 Voltage for cutoff of undeflected focused spot	−4.6% of $E_{c_{2+4}}$		volts
Maximum Grid-No.3 Current.	−15 to +10		μa
Maximum Cathode Current.	*See Curve*		
Deflection Factors:			
DJ_1 & DJ_2.	36 to 48	v dc/in./kv of $E_{c_{2+4}}$	
DJ_3 & DJ_4.	35 to 47	v dc/in./kv of $E_{c_{2+4}}$	
Focused Beam Position. .	##		
Writing Speed††.	300000		in./sec

Examples of Use of Design Ranges:*

For grids-No.2 & No.4 voltage ($E_{c_{2+4}}$)▲	*2000*	*volts*
Grid-No.3 Voltage for focus.	350 to 750	volts
Maximum Grid-No.1 Voltage for cutoff of undeflected focused spot.	−92	volts
Deflection Factors:		
DJ_1 & DJ_2.	72 to 96	volts
DJ_3 & DJ_4.	70 to 94	volts

Equivalent Values of Writing-Gun Voltages Referred to Cathode of Viewing Gun:

Cathode Voltage.	−1850	−1875	volts
Grid-No.3 Voltage for focus. .	−1100 to −1500	−1125 to −1525	volts
Grids-No.2 & No 4 Voltage▲ . .	+150	+125	volts

VIEWING SECTION and WRITING SECTION

Circuit Values:

Grid-No.1-Circuit Resistance (Either gun).	1 max.	megohm
Resistance in Any Deflecting-Electrode Circuit■. . . .	0.1 max.	megohm
Series Current-Limiting Resistor (Unbypassed) in Grid-No.5 (Viewing-Section) Circuit	0.01 min.	megohm

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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.

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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.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

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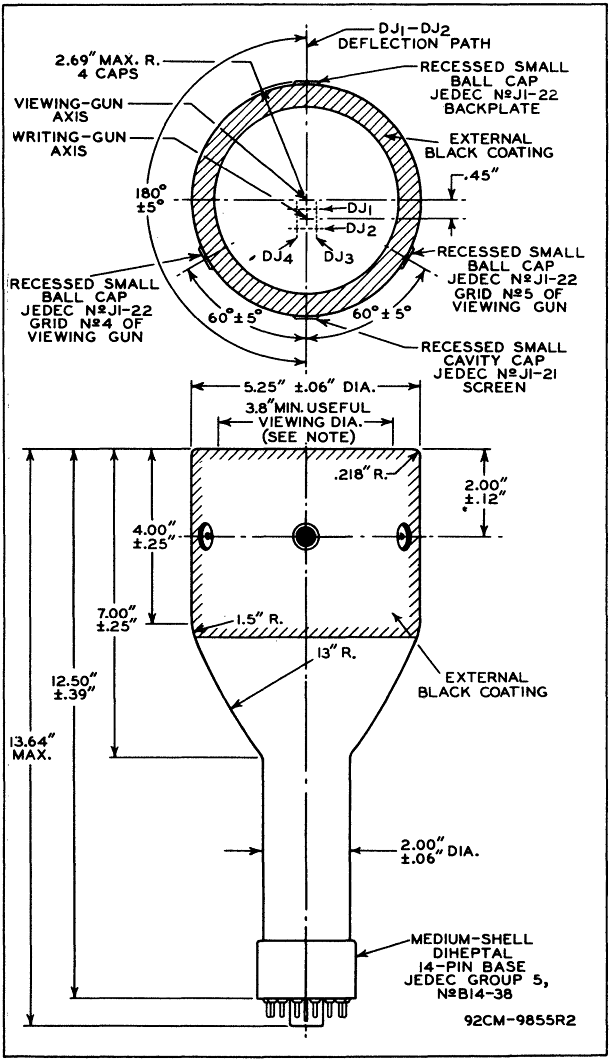
DISPLAY STORAGE TUBE



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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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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^{o} 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 $\pm 10^{o}$. 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 $\pm 10^{o}$. ANGLE BETWEEN $DJ_1 - DJ_2$ DEFLECTION PATH AND $DJ_3 - DJ_4$ DEFLECTION PATH IS $90^{o} \pm 3^{o}$.

RCA

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TYPICAL CHARACTERISTICS

VIEWING SECTION

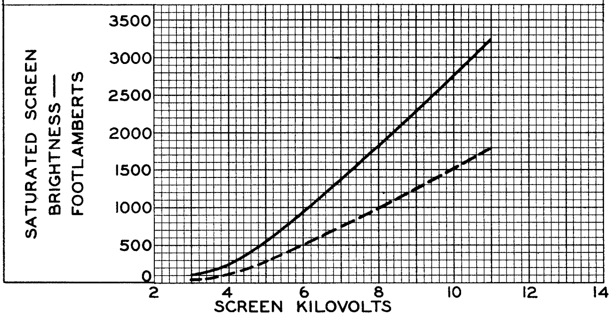
E_f = 6.3 VOLTS
BACKPLATE VOLTS* = 2

GRID-№4 VOLTS*
GRID-№3 VOLTS*
GRID-№1 VOLTS*
} ADJUSTED FOR BRIGHTEST, MOST 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

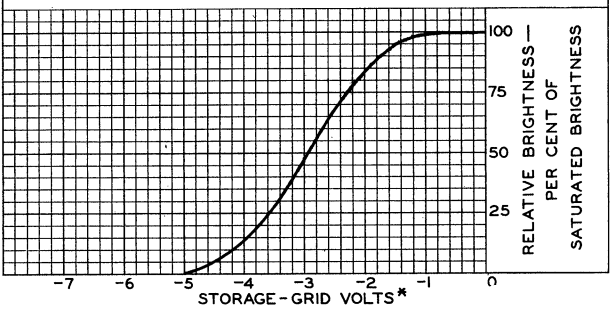
E_f = 6.3 VOLTS
SCREEN VOLTS* = 10000
BACKPLATE VOLTS* = 2
GRID-№5 VOLTS* = 150

GRID-№4 VOLTS
GRID-№3 VOLTS
GRID-№1 VOLTS
} ADJUSTED FOR BEST COLLIMATION.

GRID-№2 VOLTS* = 125

* REFERRED TO CATHODE OF VIEWING GUN.

WRITING SECTION
NORMAL OPERATION

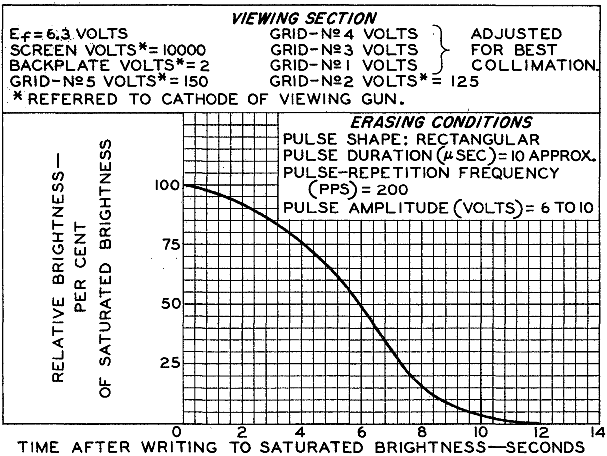


92CS-9861

RCA

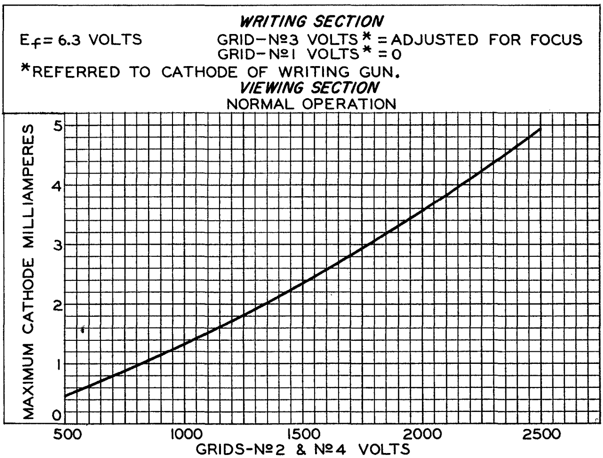
7448

TYPICAL ERASURE CHARACTERISTIC



92CS-9860

WRITING-GUN-CURRENT CHARACTERISTIC



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