TUBE HANDBOOK
ALL TYPES

This HANDBOOK of data on all RCA tubes has been compiled to meet the requirements of electronic engineers for tube information which can be kept up-to-date. Its convenient, loose-leaf form permits the revision of data on existing tubes and the addition of data on new tubes as they are made available.

The material is arranged in sections with tabbed separators to facilitate quick reference. The general section contains a table of contents for the complete Handbook, a detailed explanation of tube ratings and typical operating conditions, tube outline drawings, base drawings, and other useful information concerning tubes. The other sections, indexed according to tube classes, contain ratings, characteristics, operating conditions, and curves for the many different tubes in those classes.

The RCA Tube Handbook is especially useful to designers of tube equipment but will prove helpful to anyone having need for concise data on our various tubes. If further data on any tube type are desired, we shall be glad to be of assistance.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA TUBE HANDBOOK HB-3

GENERAL SECTION

The information in this section, in general, applies to all classes of RCA tubes. It includes the Index of Contents for all sections, preferred-type lists, discussion of ratings, drawings of bases, caps, and tubes, as well as other general information of interest to the equipment designer.

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

NOTICE

Service sheets for this Handbook will be sent during the subscription period to the subscriber whose name appears in our records.

In case this Handbook is resold or transferred within any subscription period, we shall be glad to register the change and to send service sheets to the new owner providing he notifies us of the change.

Each of the binders for this Handbook has an identifying serial number at the lower right of the inside back cover. Use of these numbers in correspondence pertaining to this Handbook is requested to facilitate its identification in our records.

In order that the new owner may not miss any of the service sheets, notification for change in registration of ownership of this Handbook identified by serial numbers should be forwarded promptly to

Commercial Engineering
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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Sheets in the RCA Tube Handbook are arranged in the TABLE OF CONTENTS in order of appearance in each section. To facilitate location of tube types when only the type number is known, the INDEX OF TUBE TYPES, which follows the TABLE OF CONTENTS, lists type numbers in numerical-alphabetical-numerical sequence.

The TABLE OF CONTENTS and INDEX OF TUBE TYPES may be used to determine:

(1) location of individual data sheets
(2) completeness of Handbook
(3) arrangement of Handbook sheets

Reference is to front of sheet only unless otherwise indicated. Date appearing on sheet is identified by month and year only (i.e., 2-56).

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For tube types in Cathode-Ray Tube Section, see tube types with letter "C" in "Section" column of INDEX OF TUBE TYPES starting on sheet INDEX OF TUBE TYPES 1.

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This INDEX OF TUBE TYPES is arranged in numerical-alphabetical-numerical sequence of tube types. The letter in the "Section" column indicates the particular section in which the tube type will be found. The sections are keyed as follows:

C = CATHODE RAY
F = THYRATRON & IGNITRON
G = GENERAL
M = MISCELLANEOUS
P = PHOTOTUBE
R = RECEIVING
S = SEMICONDUCTOR DEVICE
T = TRANSMITTING

" Indicates that data for this type follow data for another type on same sheet.

* Type is approaching obsolescence. Not recommended for new equipment design.

● Discontinued type. Data retained in Handbook for reference purposes only.

Reference is to front of sheet only unless otherwise indicated. Date appearing on sheet is identified by month and year only (i.e., 2-56).

Tube Type	Section	Sheet & Date
OA2	M	DATA 1, 11-54
	M	DATA 2, 12-47
OA3	M	OA3/VR75 DATA, 4-44
OA4-G	M	TENT. DATA, 4-38
OB2	M	DATA, 1-55
OC3	M	OC3/VR105 DATA, 4-44
OD3	"	OD3/VR150 DATA, 4-44 (On back of OC3/VR105 sheet)
OZ4*, OZ4-G*	R	TENT. DATA, 9-38
1A3	R	DATA, 8-43
1A5-GT*	R	1A5-GT/1A5-G TENT. DATA, 5-41
1A6●	R	DATA, 4-37
1A7-GT	R	1A7-GT/G DATA, 1-43
1AC5*	R	TENT. DATA, 9-49
	R	CURVE 92CM-7261
1AD5*	R	TENT. DATA, 9-49
	R	CURVE 92CM-7251
	R	CURVE 92CM-7250
1B3-GT	R	1B3-GT/8016 DATA, 11-49
1C5-GT*	R	1C5-GT/1C5-G TENT. DATA, 5-41
1C21	M	TENT. DATA, 12-42
1D8-GT●	R	DATA, 9-41
	R	CURVE 92C-6059
1E8*	R	TENT. DATA, 9-49
	R	CURVE 92CM-7165

Tube Type	Section	Sheet & Date
1H5-GT	R	1H5-GT/G DATA, 1-43
1L4	R	TENT. DATA, 6-42
1L6*	R	TENT. DATA, 8-53
1LA4●	R	TENT. DATA, 5-41
1LA6*	"	TENT. DATA, 5-41 (On 1LA4 sheet)
1LB4*	R	DATA, 10-47
1LC5*	"	DATA, 10-47 (On back of 1LB4 sheet)
1LC6*	R	DATA, 10-47
1LD5*	R	DATA, 10-47
1LE3*	"	DATA, 10-47 (On back of 1LD5 sheet)
1LG5*	R	DATA, 2-49
1LH4*	R	DATA, 10-47
1LN5*	"	DATA, 10-47 (On back of 1LH4 sheet)
1N5-GT	R	1N5-GT/G DATA, 1-43
1N34-A	S	TENT. DATA, 8-53
1N38-A	S	TENT. DATA, 8-53
1N54-A	S	TENT. DATA, 8-53
1N55-A	S	TENT. DATA, 8-53
1N56-A	S	TENT. DATA, 8-53
1N58-A	S	TENT. DATA, 8-53
1P21	P	DATA, 11-49
	P	CURVE 92CM-6456R3
	P	CURVE 92CM-7018R1
1P22	P	DATA, 3-48
	P	CURVE 92CM-6585R1

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Tube Type	Section	Sheet & Date
1P28......	P	DATA 1, 7-55
	P	DATA 2, 7-55
	P	CURVE 92CL-6547R3
1P29......	P	DATA, 8-47
	P	CURVE 92CM-6472R1
1P37......	P	DATA, 8-47
1P39......	P	DATA, 8-47
1P40......	"	DATA, 8-47 (On 1P39 sheet)
1P41......	P	DATA, 11-50
	P	CURVE 92CM-5217R3
1P42......	P	DATA, 7-50
	P	CURVE 92CM-6783R2
1Q5-GT*...	R	1Q5-GT/1Q5-G DATA, 7-41
1R5.......	R	DATA, 5-42
	R	CURVE 92C-6098R1
1S4*......	R	DATA, 1-42
	R	CURVE 92C-6175R1
1S5.......	R	DATA, 6-47
1T4.......	R	DATA, 1-55
	R	CURVE 92C-6357
1T6*......	R	TENT. DATA, 9-49
	R	CURVE 92CM-7257
	R	CURVE 92CM-7259
1U4.......	R	DATA, 11-54
	R	CURVE 92CM-6669R1
1U5.......	R	TENT. DATA, 6-47
	R	CURVE 92CM-6172R1
1-v*......	R	DATA, 2-40
1V2.......	R	TENT. DATA, 11-49
1X2-A*....	R	TENT. DATA, 11-50
1X2-B.....	R	TENT. DATA, 3-54
2A3.......	R	DATA, 10-47
	R	CURVE 92S-5233R1
2A4-G●....	M	TENT. DATA, 7-41
2A7●......	R	DATA, 11-37
2AF4-A....	R	DATA, 3-55
2AP1-A*...	C	DATA 1, 7-45
	C	DATA 2, 7-45
	C	CURVE 92CM-6410R1
2B7●......	R	DATA, 12-47
2BP1......	C	DATA, 9-50
	C	CIRCUIT CE-6777R1
	C	CURVE 92CM-6748R1
2BP11.....	C	DATA, 9-50
2C21/1642●	M	TENT. DATA, 3-43
	M	CURVE 92CM-6385R1
2C39-A*...	T	TENT. DATA 1, 10-53
	T	TENT. DATA 2, 10-53
	T	OUTLINE CE-8000
	T	CURVE 92CM-7998
2C40*.....	M	TENT. DATA, 11-45
	M	CURVE 92CM-6507
2C43*.....	M	TENT. DATA, 11-45
	M	CURVE 92CM-6508

Tube Type	Section	Sheet & Date
2D21......	F	DATA, 6-48
	F	CURVE CE-6534T2
	F	CURVE 92CM-6531R1
2E24......	T	DATA 1, 11-50
	T	DATA 2, 11-50
	T	DATA 3, 11-50
	T	CURVE 92CM-6659R1
2E26......	T	DATA 1, 8-54
	T	DATA 2, 8-54
	T	DATA 3, 8-54
	T	OUTLINE CE-6607R2
	T	CURVE 92CM-6630
2F21......	C	TENT. DATA, 6-46
	C	OUTLINE CE-6653
2J50......	M	TENT. DATA, 1-51
	M	COUPLING CE-7509
	M	OUTLINE CE-7507B
	M	CURVE 92CM-7511
2K26......	M	TENT. DATA 1, 11-48
	M	TENT. DATA 2, 11-48
	M	OUTLINE CE-6986VB
	M	COUPLING ARRANGEMENT CE-7008VB
	M	CURVE CE-7003T
2N32●.....	S	TENT. DATA, 6-53
	S	OUTLINE CE-7970
2N33●.....	S	TENT. DATA, 6-53
2N34●.....	S	TENT. DATA, 6-53
	S	CURVE 92CM-7962
2N35●.....	S	TENT. DATA, 6-53
	S	CURVE 92CM-7959
2X2-A.....	M	DATA, 9-55
3A2.......	R	TENT. DATA, 5-54
3A3.......	R	TENT. DATA, 3-54
3A4.......	M	DATA, 12-44
	M	CURVE 92C-6370
3A5.......	M	TENT. DATA, 6-42
	M	CURVE 92C-6376
3AL5......	R	DATA, 7-55
3AP1-A*...	C	DATA, 6-46
3AU6......	"	DATA, 7-55 (On 3AL5 sheet)
3AV6......	"	DATA, 7-55 (On 3AL5 sheet)
3B2.......	R	TENT. DATA, 7-55
3B25......	T	TENT. DATA, 7-45
3B28......	T	TENT. DATA 1, 2-52
	T	TENT. DATA 2, 2-52
3BC5......	R	DATA, 2-56
3BN6......	"	DATA, 2-56 (On 3BC5 sheet)
3BP1-A....	C	DATA 1, 7-45
	C	DATA 2, 7-45
	C	CURVE 92CM-6412R1

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3BY6 TO 5AM8

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Tube Type	Section	Sheet & Date
3BY6......	"	DATA, 2-56 (On 3BC5 sheet)
3BZ6......	"	DATA, 2-56 (On back of 3BC5 sheet)
3C23......	F	TENT. DATA, 5-46
3C33......	T	DATA, 3-48
	T	OUTLINE CE-6780
3C45......		*See 6130/3C45*
3CB6......	"	DATA, 2-56 (On back of 3BC5 sheet)
3CF6......	"	DATA, 2-56 (On back of 3BC5 sheet)
3D22-A....	F	DATA 1, 7-55
	F	DATA 2, 7-55
	F	DATA 3, 7-55
	F	CURVE CE-6483T3
	F	CURVES CE-6865T1-6830T
3E22*.....	T	TENT. DATA 1, 12-46
	T	TENT. DATA 2, 6-46
3E29......	T	DATA 1, 5-54
	T	DATA 2, 5-54
	T	CURVE 92CM-7927
3JP1......	C	DATA 1, 8-51
	C	DATA 2, 8-51
	C	CURVE 92CM-7671
3JP7......	C	DATA, 8-51
3KP1......	C	DATA, 9-49
	C	CIRCUIT CE-6690R1
	C	CURVE 92CM-7191
	C	CURVE 92CM-7194
3KP4*.....	C	TENT. DATA 1, 11-48
	C	TENT. DATA 2, 11-48
3KP11.....	C	DATA, 9-49
3LF4*.....	R	DATA, 10-47
3MP1*.....	C	TENT. DATA, 7-50
	C	OUTLINE CE-7488
3Q4.......	R	TENT. DATA, 5-41
	R	CURVE 92C-6281
3Q5-GT....	"	3Q5-GT/G DATA, 5-42 (On back of 3Q4 curve 92C-6281)
3RP1......	C	DATA, 9-55
3RP1-A....	C	TENT. DATA 1, 7-55
	C	TENT. DATA 2, 7-55
	C	CURVE 92CM-7143R1
3RP4......	C	DATA, 9-55
3S4.......	R	DATA, 1-55
3V4.......	R	DATA, 1-55
4-65A.....	T	TENT. DATA 1, 5-49
	T	TENT. DATA 2, 5-49
	T	OUTLINE CE-7156
	T	CURVES CE-7164T-7163T
4-125A/ 4D21.....	T	DATA 1, 11-48
	T	DATA 2, 11-48
	T	OUTLINE CE-6764
4-250A/ 5D22.....	T	TENT. DATA 1, 11-48
	T	TENT. DATA 2, 11-48
	T	OUTLINE CE-7075
4-1000A*..	T	TENT. DATA 1, 10-53
	T	TENT. DATA 2, 10-53
	T	OUTLINE CE-7930
4BC8......	R	DATA, 2-56
4BQ7-A....	"	DATA, 2-56 (On 4BC8 sheet)
4BZ7......	"	DATA, 2-56 (On 4BC8 sheet)
4C33......	T	DATA, 5-49
	T	OUTLINE CE-6936
4D21......		*See 4-125A/4D21*
4E27/8001.	T	DATA 1, 3-45
	T	DATA 2, 3-45
	T	CURVE 92CM-6261R1
	T	CURVES 92CM-6262T1 & 92CM-6263T1
4E27A/ 5-125B...	T	DATA 1, 11-54
	T	DATA 2, 11-54
	T	DATA 3, 11-54
	T	CURVE 92CM-7512
4J50......	M	TENT. DATA 1, 6-54
	M	TENT. DATA 2, 6-54
	M	OUTLINE CE-8296-8297B
4J52......	M	TENT. DATA 1, 10-53
	M	TENT. DATA 2, 10-53
	M	OUTLINE CE-7858-7857B
4X150A....	T	DATA 1, 1-54
	T	DATA 2, 1-54
	T	DATA 3, 1-54
	T	OUTLINE CE-7153R2
	T	CURVE 92CM-7152R1
4X150D....	T	DATA, 5-55
4X500A....	T	DATA, 9-48
	T	OUTLINE CE-7028
5-125B....		*See 4E27A/5-125B*
5ABP1.....	C	TENT. DATA 1, 6-53
	C	TENT. DATA 2, 6-53
	C	OUTLINE CE-7842
	C	CURVE 92CM-7910
5ABP4.....	C	DATA, 11-55
5ABP7.....	"	DATA, 11-55 (On 5ABP4 sheet)
5ABP11....	"	DATA, 11-55 (On 5ABP4 sheet)
5AM8......	R	DATA, 2-56

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RCA

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5AN8	"	DATA, 2-56 (On 5AM8 sheet)
5AQ5	"	DATA, 2-56 (On 5AM8 sheet)
5AS4	R	TENT. DATA, 2-56
5AS8	R	DATA, 2-56
5AT8	"	DATA, 2-56 (On 5AS8 sheet)
5AUP24	C	TENT. DATA 1, 8-54
	C	TENT. DATA 2, 8-54
	C	CURVE 92CM-8343
5AV8*	"	DATA, 2-56 (On back of 5AS8 sheet)
5AYP4	C	TENT. DATA, 5-55
	C	OUTLINE CE-8559
	C	CURVE 92CM-7688R2
5AZ4*	R	DATA, 5-49
5BP1-A*	C	DATA 1, 7-45
	C	DATA 2, 7-45
	C	CURVE 92CM-4984R3
5CP1-A	C	DATA 1, 10-51
	C	DATA 2, 10-51
	C	OUTLINE CE-6408R4
	C	CURVE 92CM-6821
5CP7-A	C	TENT. DATA, 4-47
5CP11-A	C	TENT. DATA, 4-47
5CP12	C	DATA, 10-51
5D22		*See 4-250A/5D22*
5FP4-A	C	DATA, 8-51
	C	OUTLINE CE-6362R4
5FP7-A	C	DATA, 8-51
5FP14	C	DATA, 8-51
5J6	R	DATA, 3-55
5R4-GY	M	DATA, 9-48
	M	CURVES CE-6418T1-6415T
5T4*	R	DATA, 2-40
5TP4*	C	DATA, 3-48
	C	OUTLINE CE-6656R2
5U4-G	R	DATA 1, 3-51
	R	DATA 2, 3-51
	R	CURVE 92CM-7497
5U4-GB	R	TENT. DATA 1, 11-54
	R	TENT. DATA 2, 11-54
	R	OUTLINE CE-8444R1
	R	RATING CHART II 92CM-8451
	R	CURVE 92CM-8446
5U8	R	DATA, 3-55
5UP1	C	TENT. DATA, 12-46
	C	CIRCUIT CE-6819
	C	CURVE 92CM-6808
	C	CURVE 92CM-6810
5UP7	C	TENT. DATA, 12-46
5UP11	C	TENT. DATA, 12-46
5V4-G	R	DATA, 9-41

Tube Type	Section	Sheet & Date
5W4●, 5W4-GT●	R	5W4, 5W4-GT/G DATA, 3-43
5WP11	C	TENT. DATA 1, 2-49
	C	TENT. DATA 2, 2-49
5WP15	C	TENT. DATA, 6-48
	C	DRAWING CE-6919
	C	CURVE 92CM-6916
5X4-G*	"	DATA, 3-43 (On back of 5W4 sheet)
5X8	R	DATA, 3-55
5Y3-G●, 5Y3-GT	R	DATA 1, 1-51
	R	DATA 2, 1-51
	R	CURVE 92CM-7395
5Y4-G●	R	DATA, 5-55
5Y4-GT*	"	DATA, 5-55 (On 5Y4-G sheet)
5Z3*	"	DATA, 5-55 (On back of 5Y4-G sheet)
5Z4	R	DATA, 9-41
5ZP16	C	TENT. DATA, 3-51
	C	OUTLINE CE-7574
	C	CURVE 92CM-7576
6A3●	R	TENT. DATA, 5-41
6A6●	R	DATA, 4-37
6A7*	R	DATA, 7-41
6A7S●	R	DATA, 12-41
6A8*, 6A8-G*, 6A8-GT*	"	DATA, 12-41 (On 6A7S sheet)
	R	CURVE 92C-4521
6AB4	R	DATA, 5-52
6AB5/6N5*	R	DATA, 4-40
6AB7*	R	6AB7/1853 DATA, 12-41
	R	CURVES 92C-6144 & 92C-6145
6AC5-GT*	R	6AC5-GT/6AC5-G DATA, 5-41
6AC7	R	6AC7/1852 DATA, 12-41
	R	CURVE 92C-6146R1
6AD7-G*	R	DATA, 9-41
	R	CURVE 92C-6153
6AF4*	R	DATA, 11-54
6AF4-A	R	TENT. DATA, 11-54
	R	CURVE 92CM-7756
	R	CURVE 92CM-7759R1
6AF6-G	R	DATA, 12-44
6AG5	R	DATA, 1-55
	R	CURVE 92CM-6399R2
6AG7	R	DATA 1, 11-52
	R	DATA 2, 11-52
	R	CURVES CE-6035T1-6036T1
6AH4-GT*	R	TENT. DATA, 8-53

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6AH6 TO 6BQ6-GT

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6AH6*.....	R	TENT. DATA, 11-49
	R	CURVE 92CM-7339
6AK5.......	R	DATA, 9-55
	R	CURVE 92CM-6504
6AK6.......	R	TENT. DATA, 10-43
	R	CURVE 92C-6449
6AL5.......	R	DATA, 5-54
	R	CURVE 92CM-6561
6AL7-GT*..	R	DATA, 2-49
	R	TYPICAL CIRCUITS 92CS-7169
6AM8.......	R	TENT. DATA, 3-55
	R	CURVE CE-8504T
6AN8.......	R	TENT. DATA, 3-54
	R	CURVE 92CM-8209
	R	CURVE 92CM-8206
6AQ5.......	R	DATA, 5-52
6AQ6.......	R	TENT. DATA, 6-44
	R	CURVE 92CM-6552
6AQ7-GT*..	R	DATA, 5-50
6AR5*.....	R	DATA, 5-49
6AS5.......	R	TENT. DATA, 3-48
	R	CURVE 92CM-6921R1
6AS6.......	M	TENT. DATA, 2-50
	M	CURVE 92CM-7401
	M	CURVE 92CM-7408
	M	CURVE 92CM-7404
6AS7-G....	M	DATA, 5-55
	M	CURVE 92CM-6618
6AS8.......	R	TENT. DATA, 5-54
	R	CURVE 92CM-8206
6AT6.......	R	DATA, 9-55
	R	CURVE 92CM-6610
6AT8.......	R	DATA, 3-55
6AU4-GT*..	R	TENT. DATA, 3-54
6AU4-GTA..	R	TENT. DATA, 9-55
6AU5-GT...	R	DATA 1, 11-54
	R	CURVE 92CM-7355
6AU6.......	R	DATA, 8-54
	R	CURVE 92CM-6611
	R	CURVE 92CM-6623
	R	CURVE 92CM-6854
6AV5-GT*..	R	TENT. DATA, 4-53
	R	CURVE 92CM-7941
6AV6.......	R	DATA, 8-54
6AW8.......	R	TENT. DATA 1, 3-55
	R	TENT. DATA 2, 7-55
	R	CURVE 92CM-8647
	R	CURVE 92CM-8646
6AX4-GT...	R	DATA, 3-55
6AX5-GT...	R	TENT. DATA 1, 2-50
	R	TENT. DATA 2, 2-50
	R	CURVE 92CM-7382
6AZ8.......	R	TENT. DATA 1, 3-55
	R	TENT. DATA 2, 3-55
	R	CURVE 92CM-8519
	R	CURVE 92CM-8521
	R	CURVE 92CM-8523
6B4-G*....	R	TENT. DATA, 5-41
6B5●......	"	TENT. DATA, 5-41 (On 6B4-G sheet)
6B7●......	R	DATA, 12-47
	R	CURVE 92CM-4880
6B8*......	R	DATA, 9-41
	R	CURVE 92C-4660
6BA6.......	R	DATA, 5-54
	R	CURVE 92CM-6609
	R	CURVE 92CM-6620
6BA7.......	R	TENT. DATA, 9-48
	R	CURVE 92CM-6982R1
	R	CURVE 92CM-6980R2
6BC4.......	R	TENT. DATA, 6-54
	R	CURVE 92CM-8241
6BC5.......	R	DATA, 3-55
6BC7.......	R	TENT. DATA, 3-54
6BC8.......	R	TENT. DATA, 2-56
	R	CURVE 92CM-8789
	R	CURVE 92CM-8788R1
6BD4-A....	R	TENT. DATA, 6-54
	R	CIRCUIT & CURVE CE-8071R2-8068T1
6BD6*.....	R	TENT. DATA, 2-50
6BE6.......	R	DATA, 5-54
	R	CURVE 92CM-6625
	R	CURVE 92CM-6601
6BF5*.....	R	TENT. DATA, 10-53
6BF6.......	R	DATA, 11-52
6BG6-G....	R	DATA, 9-55
	R	CURVE 92CM-6774R1
	R	CURVE 92CM-6776R1
6BH6.......	R	DATA, 9-55
	R	CURVE 92CM-6892
	R	CURVE 92CM-6893
6BJ6.......	R	DATA, 9-55
	R	CURVE 92CM-6867
	R	CURVE 92CM-6870
6BK4.......	R	TENT. DATA, 3-55
	R	CIRCUIT CE-8435
6BK5.......	R	TENT. DATA, 5-55
6BK7-A*...	R	TENT. DATA, 6-54
6BL4.......	R	TENT. DATA, 3-55
6BL7-GT...	R	DATA, 10-53
	R	CURVE 92CM-8133
6BN6.......	R	TENT. DATA, 2-56
6BQ6-GT*..	R	DATA, 8-54
	R	CURVE 92CM-7459

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6BQ6-GTB/ 6CU6	R	TENT. DATA, 3-55
	R	CURVE 92CM-8500
6BQ7-A	R	TENT. DATA, 11-52
	R	CIRCUITS CE-7643-7644
	R	CURVE 92CM-7538R1
	R	CURVE 92CM-7550R1
6BY5-GA*	R	TENT. DATA, 5-55
6BY6	R	TENT. DATA, 3-54
	R	CURVE 92CM-8140
	R	CURVE 92CM-8138
6BZ6	R	TENT. DATA, 5-55
	R	CURVE 92CM-8508
6BZ7	R	TENT. DATA, 6-54
6C4	R	DATA 1, 11-54
	R	CURVE 92C-6378
6C5, 6C5-GT*	R	6C5, 6C5-GT/G DATA, 3-43
	R	CURVE 92C-4511
6C6*	R	DATA, 6-48
6C8-G*	R	DATA, 12-41
6CB5	R	TENT. DATA, 3-55
	R	CURVE 92CM-8436
6CB6	R	DATA, 3-55
	R	CURVE 92CM-7378
6CD6-G	R	DATA, 9-55
	R	CURVE 92CM-7393
6CF6	R	TENT. DATA, 8-53
6CG7	R	TENT. DATA 1, 1-55
	R	TENT. DATA 2, 1-55
	R	CURVE 92CM-8441
6CL6	R	TENT. DATA, 9-52
	R	CIRCUIT CE-7804
	R	CURVE 92CM-7802
	R	CURVE 92CM-7808
6CM7	R	TENT. DATA 1, 7-55
	R	TENT. DATA 2, 7-55
	R	CURVE 92CM-8616
	R	CURVE 92CM-8613
6CS6	R	TENT. DATA, 5-55
6CU6		*See 6BQ6-GTB/6CU6*
6D6*	R	DATA, 9-41
6DC6	R	TENT. DATA, 6-54
	R	CURVE 92CM-8330
	R	CURVE 92CM-8338
6DE6	R	TENT. DATA, 9-55
	R	CURVE 92CM-8578
6E5	R	DATA, 12-44
6F4	M	TENT. DATA, 8-44
	M	CURVE 92CM-6567
6F5*, 6F5-GT*	R	DATA, 6-47

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6F6, 6F6-G*	R	DATA, 5-42
	R	DATA 2, 5-42
	R	CURVE 92C-4440
6F7*	R	DATA, 9-35
	R	CURVE 92S-5426
6F8-G*	R	DATA, 1-43
6G6-G*	R	DATA, 4-44
	R	CURVE 92CM-6122R1
6H6, 6H6-GT•	R	6H6, 6H6-GT/G DATA, 8-42
6J4	M	TENT. DATA, 4-44
	M	CURVE 92CM-6543
6J5, 6J5-GT	R	DATA, 9-50
	R	CURVE 92CM-6448
6J6	R	DATA, 3-55
	R	CURVE 92CM-6403R1
	R	CURVE 92CM-7672
6J7, 6J7-G•, 6J7-GT*	R	DATA 1, 6-48
	R	DATA 2, 6-48
	R	CURVES 92CM-6007R1
6J8-G•	R	TENT. DATA, 7-41
6K6-GT	R	DATA 1, 10-51
	R	DATA 2, 10-51
	R	CURVE 92CM-4881R2
	R	CURVE 92CM-6313
6K7*, 6K7-G•, 6K7-GT*	R	DATA, 9-41
6K8, 6K8-G•, 6K8-GT•	R	DATA, 5-41
6L4	M	TENT. DATA, 5-49
	M	CURVE 92CM-7202
6L6, 6L6-G	R	DATA 1, 11-54
	R	DATA 2, 11-54
	R	DATA 3, 11-54
	R	CURVE 92C-4581R1
	R	CURVE 92C-4608
6L7, 6L7-G•	R	DATA, 2-40
	R	CURVE 92C-4447
	R	CURVE 92C-4531
	R	CURVE 92C-4536
6N5		*See 6AB5/6N5*
6N6-G•	R	TENT. DATA, 12-39
6N7*, 6N7-GT	R	6N7, 6N7-GT/G DATA, 6-42
	R	CURVE 92C-4611

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7B8*......	R	DATA, 6-47
7BP7-A*...	C	TENT. DATA, 6-48
	C	OUTLINE CE-6367R3
7C5*......	"	DATA, 6-47 (On back of 7B8 sheet)
7C6*......	R	TENT. DATA, 4-40
7C7*......	"	TENT. DATA, 5-40 (On back of 7C6 sheet)
7C24......		*See 5762/7C24*
7CP1......	C	DATA, 8-46
	C	OUTLINE CE-6364R2
7DP4*.....	C	DATA, 11-49
	C	OUTLINE CE-6664R1A
	C	CURVE 92CM-6674R1
7E6●......	R	DATA, 9-48
7E7*......	R	DATA, 9-48
7F7*......	R	DATA, 12-47
7F8*......	R	DATA, 12-47
7G7*......	R	DATA, 12-47
7H7*......	R	DATA, 12-47
7J7*......	R	DATA, 12-47
7JP4*.....	C	TENT. DATA, 9-47
	C	OUTLINE CE-6667
	C	CURVE 92CM-6888
7K7*......	R	DATA, 5-49
7L7*......	R	DATA, 10-47
7MP7......	C	DATA, 10-51
	C	OUTLINE CE-7438R3
7MP14.....	C	DATA, 10-51
7N7*......	"	DATA, 10-47 (On back of 7L7 sheet)
7NP4......	C	TENT. DATA 1, 6-53
	C	TENT. DATA 2, 11-50
	C	NOTES CE-7476B
	C	CURVE 92CM-7515
7Q7*......	R	TENT. DATA, 5-41
7QP4......	C	TENT. DATA, 1-51
	C	OUTLINE CE-7524A
	C	CURVE 92CM-7529
7R7*......	R	DATA, 10-47
7TP4......	C	TENT. DATA, 2-52
	C	OUTLINE CE-7691
	C	CURVE 92CM-7688
7V7*......	R	DATA, 6-48
7VP1......	C	TENT. DATA 1, 11-52
	C	TENT. DATA 2, 11-52
7W7*......	"	DATA, 6-48 (On back of 7V7 sheet)
7WP4......	C	TENT. DATA 1, 7-52
	C	TENT. DATA 2, 7-52
	C	NOTES CE-7731
	C	CURVE 92CM-7515
7X7*......	R	DATA, 3-48
7Y4*......	R	DATA, 12-47

Tube Type	Section	Sheet & Date
7Z4*......	"	DATA, 12-47 (On back 7Y4 sheet)
8D21......	T	DATA 1, 9-48
	T	DATA 2, 9-48
	T	DATA 3, 9-48
	T	OUTLINE DETAILS CE-6687V2B
	T	CURVE 92CM-6989
9C21......	T	DATA 1, 10-47
	T	DATA 2, 10-47
	T	CURVE 92CM-6457
	T	CURVE 92CM-6458
	T	CURVE 92CM-6462
9C22*.....	T	DATA 1, 10-51
	T	DATA 2, 10-51
	T	OUTLINE CE-6447R2-6519
9C25......	T	TENT. DATA 1, 8-46
	T	DATA 2, 5-49
	T	OUTLINE CE-6750
	T	CURVE 92CM-7269
	T	CURVE 92CM-7234
10BP4-A*..	C	DATA, 5-50
	C	OUTLINE CE-6663R3A
	C	CURVE CE-7448
	C	CURVE 92CM-7454
10FP4-A*..	C	TENT. DATA, 8-51
	C	OUTLINE CE-7629
10KP7.....	C	DATA, 11-55
	C	OUTLINE CE-6932R2
10SP4.....	C	TENT. DATA, 7-52
	C	OUTLINE CE-7729
	C	CURVE 92CM-7773
10-Y*.....	T	DATA, 12-46
12A6*.....	M	TENT. DATA, 5-42
	M	CURVE 92C-6327
12A8-GT*..	R	DATA, 9-55
12AB5.....	R	TENT. DATA 1, 9-55
	R	TENT. DATA 2, 9-55
	R	CURVE 92CM-8756
12AH7-GT*.	R	DATA, 9-55
12AL5.....	R	DATA, 5-54
12AQ5.....	R	TENT. DATA 1, 8-53
	R	TENT. DATA 2, 5-54
12AT6.....	"	DATA, 5-54 (On back of 12AQ5 sheet)
12AT7.....	R	DATA, 3-54
	R	CURVE 92CM-7056
12AU6.....	"	DATA, 2-49 (On back of 12AT7 curve 92CM-7056)
12AU7.....	R	DATA 1, 3-55
	R	DATA 2, 3-55
12AV6.....	R	DATA, 10-47
12AV7*....	R	TENT. DATA, 6-54
12AW6.....	R	TENT. DATA, 4-47
	R	CURVE 92CM-6855

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14FP4/ 14CP4*...	C	TENT. DATA 1, 2-56
	C	TENT. DATA 2, 2-56
	C	OUTLINE CE-8877B
	C	CURVE 92CM-8859
14F7*.....	"	DATA, 11-48 (On back of 14C7 sheet)
14F8*.....	"	DATA, 11-48 (On back of 14C7 sheet)
14H7●.....	"	DATA, 11-48 (On back of 14C7 sheet)
14HP4.....	C	TENT. DATA 1, 11-54
	C	TENT. DATA 2, 11-54
	C	OUTLINE CE-8335R1B
	C	CURVE 92CM-8392
14J7●.....	R	DATA, 5-50
14N7●.....	"	DATA, 5-50 (On 14J7 sheet)
14Q7*.....	"	DATA, 5-50 (On 14J7 sheet)
14R7*.....	"	DATA, 5-50 (On 14J7 sheet)
15GP22*...	C	TENT. DATA 1, 3-54
	C	TENT. DATA 2, 3-54
	C	OUTLINE CE-8072R1B
	C	CURVE 92CM-8067
16ADP7....	C	TENT. DATA, 2-52
	C	OUTLINE CE-7690
16AP4-A*..	C	DATA, 5-50
	C	OUTLINE CE-7449A
	C	CURVE 92CM-7471
16DP4-A*..	C	TENT. DATA, 2-52
16GP4-B*..	C	DATA 1, 2-56
	C	DATA 2, 2-56
	C	CURVE 92CM-8875
16KP4.....		*See 16RP4/16KP4*
16KP4-A...		*See 16RP4-A/16KP4-A*
16LP4-A*..	C	TENT. DATA, 2-52
16RP4/ 16KP4*...	C	DATA, 2-56
16RP4-A/ 16KP4-A*.	C	TENT. DATA 1, 2-56
	C	TENT. DATA 2, 2-56
	C	OUTLINE CE-8878B
	C	CURVE 92CM-8857
16TP4*....	C	TENT. DATA 1, 8-51
	C	TENT. DATA 2, 8-51
	C	OUTLINE CE-7632B
	C	CURVE 92CM-7628
16WP4-A*..	C	TENT. DATA, 2-52
17AVP4....	C	TENT. DATA 1, 11-55
	C	TENT. DATA 2, 11-55
	C	TENT. DATA 3, 11-55
	C	OUTLINE CE-8341B
	C	CURVE 92CM-8746

Tube Type	Section	Sheet & Date
17AVP4-A..	C	DATA, 2-56
17BP4-A*..	C	DATA, 2-56
17BP4-B*..	C	TENT. DATA 1, 2-56
	C	TENT. DATA 2, 2-56
	C	OUTLINE CE-8879B
	C	CURVE 92CM-8861
17CP4*....	C	TENT. DATA, 1-51
	C	REFERENCE-LINE GAUGE CE-7391
	C	OUTLINE CE-7535B
	C	CURVE 92CM-7533
17GP4*....	C	TENT. DATA 1, 5-51
	C	TENT. DATA 2, 5-51
	C	OUTLINE CE-7601B
	C	CURVE 92CM-7606
17HP4/ 17RP4*...	C	DATA, 2-56
17HP4-B...	C	TENT. DATA 1, 2-56
	C	TENT. DATA 2, 2-56
	C	TENT. DATA 3, 2-56
	C	OUTLINE CE-8880B
	C	CURVE 92CL-8862
17JP4*....	C	TENT. DATA, 7-52
	C	CURVE 92CM-7753
	C	OUTLINE CE-7745R2B
	C	CURVE 92CM-7652R1
17LP4/ 17VP4*...	C	DATA, 2-56
17LP4-A*..	C	TENT. DATA 1, 2-56
	C	TENT. DATA 2, 2-56
	C	OUTLINE CE-8881B
	C	CURVE 92CL-8864
17QP4*....	C	TENT. DATA 1, 7-52
	C	TENT. DATA 2, 7-52
	C	OUTLINE CE-7734R1B
	C	CURVE 92CM-7755
17QP4-A*..	C	TENT. DATA 1, 2-56
	C	TENT. DATA 2, 2-56
17RP4.....		*See 17HP4/17RP4*
17TP4*....	C	TENT. DATA 1, 10-51
	C	TENT. DATA 2, 10-51
	C	OUTLINE CE-7601R1B
	C	CURVE 92CM-7606
17VP4.....		*See 17LP4/17VP4*
19AP4-B*..	C	TENT. DATA, 9-50
	C	OUTLINE CE-7502R1
	C	CURVE 92CM-7506
19BG6-G*..	R	TENT. DATA, 9-50
19BG6-GA*.	R	TENT. DATA, 2-56
19J6*.....	R	TENT. DATA, 11-48
	R	CURVE 92CM-7061
19T8*.....	R	DATA, 9-52
19X8......	"	DATA, 9-52 (On 19T8 sheet)

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20CP4*....	C	TENT. DATA 1, 5-51
	C	TENT. DATA 2, 5-51
	C	OUTLINE CE-7596B
	C	CURVE 92CM-7616
20CP4-A...		*See 20DP4-A/20CP4-A*
20CP4-D...		*See 20DP4-C/20CP4-D*
20DP4-A/ 20CP4-A*.	C	DATA, 2-56
20DP4-C/ 20CP4-D*.	C	TENT. DATA 1, 2-56
	C	TENT. DATA 2, 2-56
	C	OUTLINE CE-8882B
	C	CURVE 92CM-8866
20HP4-A/ 20MP4*...	C	DATA, 2-56
20HP4-D*..	C	TENT. DATA 1, 2-56
	C	TENT. DATA 2, 2-56
	C	OUTLINE CE-8883B
	C	CURVE 92CL-8867
20MP4.....		*See 20HP4-A/20MP4*
21ACP4-A..	C	DATA, 2-56
21ALP4-A..	C	DATA 1, 11-55
	C	DATA 2, 11-55
	C	DATA 3, 11-55
	C	OUTLINE CE-8342R2B
	C	CURVE 92CL-8771
21ALP4-B..	C	DATA, 2-56
21AMP4-A..	C	TENT. DATA 1, 11-55
	C	TENT. DATA 2, 11-55
	C	TENT. DATA 3, 11-55
21AP4*....	C	TENT. DATA 1, 5-51
	C	TENT. DATA 2, 5-51
	C	OUTLINE CE-7649B
	C	CURVE 92CM-7653
21ATP4....	C	DATA, 11-55
21AUP4....		*See 21AVP4/21AUP4*
21AUP4-A..		*See 21AVP4-A/21AUP4-A*
21AVP4/ 21AUP4...	C	TENT. DATA 1, 11-55
	C	TENT. DATA 2, 11-55
	C	TENT. DATA 3, 11-55
	C	OUTLINE CE-8604B
	C	CURVE 92CM-8773
21AVP4-A/ 21AUP4-A.	C	DATA, 11-55
21AWP4....	C	TENT. DATA 1, 11-55
	C	TENT. DATA 2, 11-55
	C	TENT. DATA 3, 11-55
21AXP22...	C	TENT. DATA 1, 3-55
	C	TENT. DATA 2, 3-55
	C	TENT. DATA 3, 3-55
	C	DRAWING CE-8399R3B
	C	CURVE 92CM-8566
	C	CURVE 92CM-8565

Tube Type	Section	Sheet & Date
21EP4-A*..	C	DATA 1, 11-55
	C	DATA 2, 11-55
	C	OUTLINE CE-7903R1B
21EP4-B*..	C	DATA, 11-55
21FP4-A*..	C	DATA, 2-56
21FP4-C*..	C	TENT. DATA 1, 2-56
	C	TENT. DATA 2, 2-56
	C	OUTLINE CE-8884B
	C	CURVE 92CM-8868
21MP4.....	C	TENT. DATA, 5-52
	C	CURVE 92CM-7713
	C	OUTLINE CE-7646R1B
	C	CURVE 92CM-7714
21YP4.....	C	TENT. DATA 1, 8-54
	C	TENT. DATA 2, 8-54
	C	CURVE 92CM-8368
	C	OUTLINE CE-8237B
	C	CURVE 92CM-8224R1
21YP4-A...	C	DATA, 8-54
21ZP4-A...	C	TENT. DATA 1, 8-54
	C	TENT. DATA 2, 8-54
	C	CURVE 92CM-8391
	C	OUTLINE CE-8132R1B
21ZP4-B...	C	DATA, 8-54
24-A*.....	R	DATA, 4-39
24CP4-A...	C	DATA 1, 11-55
	C	DATA 2, 11-55
	C	CURVE 92CM-8648
	C	OUTLINE CE-8233R1B
	C	CURVE 92CM-8626
24DP4-A...	C	TENT. DATA 1, 11-55
	C	TENT. DATA 2, 11-55
	C	TENT. DATA 3, 11-55
24YP4.....	C	DATA, 11-55
25A6* 25A6-GT●.	R	25A6, 25A6-GT/G DATA, 3-43
25BQ6-GT*.	R	DATA, 5-52
25BQ6-GTB/ 25CU6....	R	DATA, 3-55
25CD6-GA..	R	DATA, 3-55
25CU6.....		*See 25BQ6-GTB/25CU6*
25L6......	R	DATA, 2-50
25L6-GT...	R	DATA, 5-55
25W4-GT*..	R	DATA, 3-51
25Z5*.....	R	DATA, 9-41
25Z6● 25Z6-GT..	R	25Z6, 25Z6-GT/G DATA, 3-43
26A6......	M	TENT. DATA, 6-46
	M	CURVE 92CM-6788
	M	CURVE-92CM-6784
26A7-GT...	M	DATA 1, 1-55
	M	DATA 2, 1-55
	M	CURVE 92CM-6510

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26C6	M	TENT. DATA, 6-46
	M	CURVE 92CM-6772
26D6	M	TENT. DATA, 6-46
	M	CURVE 92CM-6789
27*	R	DATA, 7-35
27MP4*	C	TENT. DATA 1, 8-53
	C	TENT. DATA 2, 8-53
	C	DRAWING CE-7908
	C	OUTLINE CE-7924B
	C	CURVE 92CM-7901
	C	CURVE 92CM-7902
35A5*	R	DATA, 6-47
35B5	R	TENT. DATA, 12-46
	R	CURVE 92CM-6312R1
35C5	R	DATA, 1-55
35L6-GT	R	DATA, 6-47
	R	CURVE 92CM-6309
	R	CURVE 92CM-6307R1
35W4	R	DATA, 9-50
	R	CURVE 92CM-6615R1
35Y4*	R	DATA, 12-47
35Z3*	R	DATA, 6-47
35Z4-GT*	"	DATA, 6-47 (On back of 35Z3 sheet)
35Z5-GT	R	35Z5-GT/G DATA, 6-43
41*	R	DATA, 10-51
42*	R	DATA, 4-38
43*	R	DATA, 6-37
45*	R	DATA, 4-38
47*	R	DATA, 11-37
50A5*	R	DATA, 12-47
50B5	R	TENT. DATA, 1-46
	R	CURVE 92CM-6603
50C5	R	DATA, 1-55
50C6-G*	R	DATA, 2-50
50L6-GT	R	DATA, 9-41
	R	CURVE 92CM-6314R1
50X6*	R	DATA, 2-50
50Y6-GT	"	DATA, 2-50 (On back of 50X6 sheet)
50Y7-GT*	R	DATA, 2-50
53●	R	DATA, 4-37
PG-67		*See 5728/PG-67*
70L7-GT*	R	DATA, 12-41
	R	CURVE 92C-6324
71-A*	R	DATA, 7-35
75*	R	DATA, 9-41
VR75		*See OA3*
76●	R	DATA, 6-48
	R	CURVE 92CM-4175R2
77●	R	DATA, 9-41
	R	CURVE 92S-5279
78*	R	DATA & CURVE 92S-5248, 4-37
80*	R	DATA, 2-40

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81●	"	DATA, 2-40 (On 80 sheet)
82●	R	DATA, 9-41
83	"	DATA, 9-41 (On back of 82 sheet)
83-v*	"	DATA, 9-41 (On back of 82 sheet)
84/6Z4*	R	DATA, 2-40
85●	R	DATA, 6-48
	R	CURVE 92CM-5197R1
105	F	TENT. DATA, 5-46
VR105		*See OC3*
117L7-GT/117M7-GT*	R	TENT. DATA, 5-41
117N7-GT*	"	DATA, 5-41 (On back of 117L7-GT/117M7-GT sheet)
117P7-GT*	R	TENT. DATA, 12-41
	R	CURVE 92C-6340
117Z3	R	DATA, 7-50
117Z6-GT*	R	117Z6-GT/G DATA, 8-43
VR150		*See OD3*
172	F	TENT. DATA, 5-46
	F	CURVE CE-6698
203-A●	T	DATA, 4-37
	T	CURVE 92S-5463
207*	T	DATA 1, 9-48
	T	DATA 2, 9-48
	T	TERMINAL-SUPPORT SHELL CE-7020
	T	CURVE 92CM-4551
	T	CURVE 92CM-5551
211*	T	DATA 1, 5-50
	T	DATA 2, 5-50
	T	CURVE 92CM-4537
217-C*	T	DATA, 6-47
502-A*	F	DATA, 5-55
	F	CURVE CE-7074T1
	F	CURVES CE-8610T-7072T1
575-A	T	DATA, 11-55
579-B	M	TENT. DATA, 5-46
627	F	TENT. DATA, 5-46
629*	F	TENT. DATA, 5-46
672-A	F	TENT. DATA, 6-48
	F	CURVES CE-6734T1-6929T
673	T	DATA 1, 11-55
	T	DATA 2, 11-55
	T	CURVE 92CM-8824
676	F	TENT. DATA, 5-46
677	F	TENT. DATA, 5-46
800*	T	DATA 1, 12-44
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801-A*	T	801-A/801 DATA, 4-40
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	T	DATA 2, 9-35 (7-38)
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851*......	T	DATA, 9-35 (4-37)
	T	DATA 2, 9-35 (1-36)
	T	CURVE 92C-4455
857-B.....	T	DATA 1, 7-55
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	T	TERMINAL-SUPPORT SHELL CE-4653R2
860*......	T	DATA, 7-38 (11-50)
	T	OUTLINE CE-4318R4
	T	CURVE 92S-5501
861*......	T	DATA, 7-38
	T	DATA 2, 4-33 (9-36)
	T	CURVE 92C-5550
862-A*....	T	DATA 1, 3-45
	T	DATA 2, 3-45
	T	CURVE 92CM-4461R1
864●......	M	DATA, 3-36
865*......	T	DATA, 9-36
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	T	CURVE 92C-4412
866-A.....	T	866-A/866 DATA, 6-44
868.......	P	DATA, 8-47
869-B.....	T	DATA 1, 11-52
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	T	CURVE 92CM-7634
872-A.....	T	872-A/872 TENT. DATA, 8-42
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874●......	M	DATA, 8-44
878*......	M	DATA, 1-36
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884, 885*	F	DATA 1, 12-44
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889-A.....	T	DATA 1, 6-46
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	T	CURVE 92C-6086
	T	CURVE 92C-6063
	T	CURVE 92C-6088
889R-A....	T	DATA 1, 6-46
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891.......	T	DATA 1, 2-50
	T	DATA 2, 2-50
	T	OUTLINE CE-4627R4
	T	CURVE 92CM-4551
	T	CURVE 92CM-4643R3
891-R.....	T	DATA 1, 2-50
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892.......	T	DATA 1, 2-50
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	T	CURVE 92CM-6136R1
	T	CURVE 92CM-4644R3
892-R.....	T	DATA 1, 2-50
	T	DATA 2, 2-50
893-A*....	T	DATA 1, 3-45
	T	DATA 2, 7-45
	T	CIRCUITS 92CM-6025R1
893A-R*...	T	DATA 1, 3-45
	T	DATA 2, 3-45
	T	CURVE 92CM-6022R2
	T	CURVE 92CM-6186R1
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898-A*....	T	DATA 1, 11-45
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	T	CIRCUITS 92CM-4388R3
	T	CURVE 92CM-4390R3
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902-A*....	C	DATA 1, 7-45
	C	DATA 2, 7-45
	C	CURVE 92CM-4895R1
908-A*....	C	DATA 1, 6-46
	C	DATA 2, 6-46
	C	CURVE 92CM-5415R5
912*......	C	DATA, 6-47
	C	OUTLINE CE-4619R3
914-A*....	C	DATA 1, 5-50
	C	DATA 2, 5-50
	C	OUTLINE CE-4718R3
917.......	P	DATA, 8-47
	P	CURVE 92CM-4360R1
918.......	P	DATA, 8-47
	P	CURVE 92CM-4351R2
919.......	P	DATA, 8-47
920.......	P	DATA, 8-47
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923*......	P	DATA, 8-47
924*......	P	DATA, 6-46
925.......	P	DATA, 8-47
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926.......	P	DATA, 6-48
927.......	P	DATA, 9-50
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928.......	P	DATA, 8-47
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929.......	P	DATA, 8-47
930.......	P	DATA, 8-47
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931-A.....	P	DATA 1, 9-55
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954	M	DATA, 6-44
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955	M	DATA, 6-44
	M	CURVE 92C-5561R1
956	M	DATA, 6-44
	M	CURVE 92C-4672R1
957	M	DATA, 6-44
958-A	M	DATA, 6-44
	M	CURVE 92CM-6334R1
959	M	DATA, 6-44
991	M	DATA, 12-39
1609	M	DATA, 1-43
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1614	T	DATA 1, 12-46
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1616	T	DATA, 5-42
1619*	T	DATA, 8-43
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	T	CURVE 92C-4931
	T	CURVE 92C-4924
1620	"	DATA, 1-43 (On back of 1612 sheet)
1621	M	DATA, 1-43
1622	M	DATA, 8-43
1623*	T	DATA, 4-40
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1624*	T	DATA, 1-43
	T	DATA 2, 1-43
1625	T	DATA, 12-44
1626*	T	TENT. DATA, 3-41
1629	M	DATA, 6-44
1631*	M	DATA, 11-45
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1633●	"	DATA, 11-45 (On 1631 sheet)
1634*	"	DATA, 11-45 (On back of 1631 sheet)
1635*	M	DATA, 4-47
	M	CURVE 92C-6358
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1949	M	DATA, 3-54
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1950	M	DATA, 3-54
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5527	C	TENT. DATA, 4-47
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5550	F	TENT. DATA, 5-46
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5551	F	TENT. DATA, 5-46
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5552	F	DATA, 3-51
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5553*	F	TENT. DATA, 5-46
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5557	F	TENT. DATA, 5-46
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	F	CURVES CE-6704T1-7562T
5560	F	DATA, 3-51
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5563●	F	TENT. DATA, 6-47
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5563-A	F	DATA 1, 1-55
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	F	CURVES CE-8300T-8316T
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5581	P	TENT. DATA, 4-47
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5582	P	DATA, 6-48
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	T	CURVE 92CM-6837
5592*......	T	TENT. DATA, 4-47
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5604-A.....	T	TENT. DATA 1, 9-55
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5651......	M	TENT. DATA, 3-48
5652......	P	TENT. DATA, 10-47
	P	CURVE 92CM-6895
5653......	P	TENT. DATA, 9-47
5654......	M	TENT. DATA, 1-53
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5690......	M	TENT. DATA 1, 4-53
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5692......	M	TENT. DATA, 3-48
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5718......	M	TENT. DATA 1, 4-53
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5719......	M	TENT. DATA 1, 6-53
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5751......	M	TENT. DATA 1, 10-53
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5770......	T	TENT. DATA 1, 9-49
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5786......	T	DATA 1, 5-54
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	T	MOUNTING CE-7117
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5794......	M	DATA 1, 11-54
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5814*.....	M	TENT. DATA 1, 6-53
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5819......	P	DATA 1, 5-54
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5820......	C	DATA 1, 1-55
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	M	CURVE 92CM-7822
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6263......	M	TENT. DATA 1, 3-54
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6264......	M	TENT. DATA 1, 3-54
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6342......	P	DATA 1, 9-55
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6372......	P	DATA 1, 9-55
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	T	CURVE 92CM-8252
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6472......	P	TENT. DATA, 5-55
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	P	CURVE 92CM-8029R1
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6474/1854.	C	TENT. DATA 1, 6-54
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6521......	M	TENT. DATA 1, 5-55
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6570......	P	TENT. DATA, 3-55
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6571......	C	TENT. DATA 1, 5-55
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6211	M	DATA 1, 4-56
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6326-A	C	TENT. DATA 1, 10-56
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6499	C	TENT. DATA 1, 8-56
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	P	CURVE 92CM-8848
6850......	T	DATA, 6-56
6861......	M	TENT. DATA, 10-56
	M	OUTLINE CE-8951
	M	CURVES CE-8971T-8969T
6866......	C	TENT. DATA 1, 10-56
	C	TENT. DATA 2, 10-56
	C	TENT. DATA 3, 10-56
	C	CURVE 92CM-9042
	C	CURVE 92CM-9044
	C	CURVE 92CM-9046
6883......	T	DATA, 8-56
6893......	T	DATA, 10-56
6903......	P	TENT. DATA 1, 10-56
	P	TENT. DATA 2, 10-56
	P	CURVE 92CM-9039
	P	CURVE 92CL-9033
8008......	T	DATA, 8-56

DELETIONS

Tube Type	Section	Sheet & Date
1N55-A....	S	TENT. DATA, 8-53
1N56-A....	S	TENT. DATA, 8-53
2J50......	M	TENT. DATA, 1-51
	M	COUPLING CE-7509
	M	OUTLINE CE-7507B
	M	CURVE 92CM-7511
2N32......	S	TENT. DATA, 6-53
	S	OUTLINE CE-7970
2N33......	S	TENT. DATA, 6-53

Tube Type	Section	Sheet & Date
2N34......	S	TENT. DATA, 6-53
	S	CURVE 92CM-7962
2N35......	S	TENT. DATA, 6-53
	S	CURVE 92CM-7959
6211......	M	CURVE 92CM-7824R1
6694......	S	TENT. DATA, 7-55
	S	OUTLINE CE-8579
	S	CURVE 92CM-8584
	S	CURVE 92CM-8593

DISCONTINUED TYPES

The following tube types have been discontinued. To indicate this fact for your future reference, please place a large dot (•) after each of the types in the "Tube Type" column of the Index of Tube Types sheets.

1AC5	6AF4	6SN7-GTA	12BY7
1Q5-GT	6AU4-GT	6ST7	20CP4
1T6	6AV5-GT	12AX4-GT	71-A
5Y4-G	6SN7-GT	12BH7	6323

Supplementary
INDEX OF TUBE TYPES
For All Sections

SUPPLEMENTARY INDEX

For key to symbols, see sheet INDEX OF TUBE TYPES 1

ADDITIONS & REVISIONS

Tube Type	Section	Sheet & Date
1K3......	R	TENT. DATA, 4-59
	R	OUTLINE CE-9889
1N1763...	S	TENT. DATA 1, 4-59
	S	TENT. DATA 2, 4-59
	S	CURVES 92CS-9723 & 92CS-9720
	S	CURVE 92CS-9982
1N1764...	S	TENT. DATA 1, 4-59
	S	TENT. DATA 2, 4-59
	S	CURVES 92CS-9722 & 92CS-9721
	S	CURVE 92CS-9988
3C45.....		*See 6130/3C45*
3CF6.....	R	DATA, 4-59
3CS6.....	"	DATA, 4-59 (On 3CF6 sheet)
3DK6.....	"	DATA, 4-59 (On 3CF6 sheet)
3DT6.....	"	DATA, 4-59 (On back of 3CF6 sheet)
5CG8.....	R	DATA, 4-59
5CL8-A...	"	DATA, 4-59 (On 5CG8 sheet)
5CQ8.....	"	DATA, 4-59 (On 5CG8 sheet)
5CZ5.....	"	DATA, 4-59 (On back of 5CG8 sheet)
6BR8-A...	R	TENT. DATA, 4-59
6CB6-A...	R	TENT. DATA, 4-59
	R	CURVE 92CM-9854
6CL8-A...	R	TENT. DATA 1, 4-59
	R	TENT. DATA 2, 4-59
6DE4.....	R	TENT. DATA, 4-59
	R	CURVE 92CS-9884
6DK6.....	R	TENT. DATA, 4-59
	R	CURVE 92CM-9851R1
6EA8.....	R	TENT. DATA, 4-59
	R	CURVE 92CM-9866
	R	CURVE 92CM-9867
6T8-A....	R	TENT. DATA 1, 4-59
	R	TENT. DATA 2, 4-59
	R	CURVE 92CM-9611R1
12AL8....	R	TENT. DATA, 4-59
	R	CURVE 92CM-9432
	R	CURVE 92CM-9423
12CN5....	R	TENT. DATA, 4-59
12CX6....	R	TENT. DATA, 4-59
12D4.....	R	TENT. DATA, 4-59
12J8.....	R	TENT. DATA, 4-59
12R5.....	R	TENT. DATA, 4-59
17AX4-GT.	R	DATA, 4-59
17BQ6-GTB	"	DATA, 4-59 (On 17AX4-GT sheet)
17DE4....	"	DATA, 4-59 (On 17AX4-GT sheet)
17DQ6-A..	"	DATA, 4-59 (On back of 17AX4-GT sheet)
21CXP4...	C	TENT. DATA 1, 4-59
	C	TENT. DATA 2, 4-59
	C	OUTLINE CE-9910B
	C	RASTER-CUTOFF-RANGE CHART 92CS-9911
	C	CURVE 92CM-9909
21DAP4...	C	TENT. DATA 1, 4-59
21WP4....	C	TENT. DATA, 4-59
21WP4-A..	"	TENT. DATA, 4-59 (On 21WP4 sheet)
21XP4-A..	C	TENT. DATA, 4-59
24AUP4...	C	TENT. DATA 1, 4-59
	C	TENT. DATA 2, 4-59
	C	RASTER-CUTOFF-RANGE CHARTS 92CS-9919 & 92CS-9918
	C	OUTLINE CE-9917B
	C	CURVE 92CM-9352
2020.....	P	TENT. DATA 1, 4-59
	P	TENT. DATA 2, 4-59
	P	CURVE 92CL-8641
	P	CURVE 92CM-8640
5551-A...	F	TENT. DATA 1, 4-59
	F	TENT. DATA 2, 4-59
	F	TENT. DATA 3, 4-59
	F	RATING CHARTS 92CS-9695 & 92CS-9698
	F	RATING CHART 92CM-9692
5552-A...	F	TENT. DATA 1, 4-59
	F	TENT. DATA 2, 4-59
	F	OUTLINE CE-9772R1A
	F	RATING CHART 92CM-9710
5553-B...	F	TENT. DATA 1, 4-59
	F	TENT. DATA 2, 4-59
	F	OUTLINE CE-9838R1A
	F	RATING CHART 92CM-9822
	F	RATING CHARTS 92CS-9825 & 92CS-9824
5642.....	D	TENT. DATA, 4-59
5686.....	D	TENT. DATA 1, 4-59
	D	TENT. DATA 2, 4-59
5687.....	D	TENT. DATA, 4-59
5750.....	D	TENT. DATA 1, 4-59
	D	TENT. DATA 2, 4-59

SUPPLEMENTARY INDEX

Supplementary

INDEX OF TUBE TYPES

For All Sections

For key to symbols, see sheet INDEX OF TUBE TYPES 1

ADDITIONS & REVISIONS

Tube Type	Section	Sheet & Date	Tube Type	Section	Sheet & Date
5822-A...	F	TENT. DATA 1, 4-59	7199.....	R	TENT. DATA 1, 4-59
	F	TENT. DATA 2, 4-59		R	TENT. DATA 2, 4-59
	F	OUTLINE & NOTES CE-9772R1B & RATING CHART 92CS-9821		R	CURVE 92CM-9704
				R	CURVES 92CS-9702 & 92CS-9703
6130/3C45	F	DATA 1, 4-59	7263.....	P	TENT. DATA 1, 4-59
	F	DATA 2, 4-59		P	TENT. DATA 2, 4-59
7025.....	R	TENT. DATA, 4-59		P	TENT. DATA 3, 4-59
	R	CURVE 92CM-6879		P	CURVE 92CM-9505
7038.....	P	DATA 1, 4-59		P	CURVE 92CM-9499
	P	DATA 2, 4-59		P	CURVE 92CS-9493

DELETIONS

Tube Type	Section	Sheet & Date	Tube Type	Section	Sheet & Date
17BWP4...	C	DATA, 9-58	5553.....	F	TENT. DATA, 5-46
5551.....	F	TENT. DATA, 5-46	5822.....	F	TENT. DATA, 2-52
5552.....	F	DATA, 3-51			

DISCONTINUED TYPES

The following types have been discontinued. To indicate this fact for your future reference please place a large dot (●) after each of the types in the "Tube Type" column of the Index of Tube Types sheets.

1LC5	17BWP4	5553	5822

INFORMATION ON PRICES

Information as to the retail prices of RCA electron tubes and semiconductor devices described in this handbook may be obtained from your local RCA Tube Distributor. A list of RCA Tube Distributors in your locality will gladly be supplied upon request to Commercial Engineering, RCA, Harrison, N.J.

Equipment manufacturers desiring price information on electron devices for initial installation in equipment will gladly be supplied such information by an RCA Equipment Sales representative, who may be reached at the following RCA Equipment Sales Offices:

(East) 744 Broad Street
Newark 1, New Jersey
Humboldt 5-3900

(Central) Suite 1181
Merchandise Mart Plaza
Chicago 54, Illinois
Whitehall 4-2900

(West) 6355 E. Washington Blvd.
Los Angeles 22, California
Raymond 3-8361

EXPORT

RCA International Division
Tube Department
Radio Corporation of America
30 Rockefeller Plaza
New York 20, N.Y. (U.S.A.)

← Indicates a change.

RCA PREFERRED TUBE TYPES

FOR NEW EQUIPMENT DESIGN

This list of Preferred Tube Types is presented to assist equipment manufacturers in formulating their plans for future production of electronic equipment. It is based on a careful survey of the needs of the engineering and manufacturing fields.

The soundness of the Preferred Tube Program, first introduced by RCA in January, 1940, has been proven with the passing years.

By using Preferred Tube Types, electronic-equipment manufacturers can reduce manufacturing costs for the following reasons:

1. LOWER INITIAL COST OF TUBES

a. We can manufacture more efficiently for stock.

b. Our production rate on preferred types is more uniform because of smaller demand for other types.

2. MORE PROFIT THROUGH BETTER DELIVERIES

a. Fewer tube types mean better deliveries and insure continuous production of electronic equipment.

3. IMPROVED QUALITY OF PRODUCT FROM LONGER PRODUCTION RUNS

a. Tube operator acquires more skill working on one type for a considerable length of time. Such skill results in better quality which means less cost to equipment manufacturers on their production line because of fewer stoppages.

4. STANDARDIZATION OF FEWER TUBE TYPES

a. Permits standardizing fewer accessory parts, such as capacitors, resistors, etc.

b. Results in purchasing and stocking economies.

5. CUSTOMER SATISFACTION

a. Purchasers of electronic equipment equipped with Preferred Type Tubes will have greater satisfaction, we believe, because these fast-moving types can be regularly stocked and will, therefore, be easier to obtain for renewal purposes.

This list, of course, is subject to change resulting from technological advances in tube design and application. When such changes become necessary, they will be incorporated in revised issues of this list.

RCA PREFERRED TUBE TYPES

Miniature Types are shown in italics

VACUUM TYPES FOR RF AND AF POWER APPLICATIONS

Values shown are Unmodulated Class C Ratings for Continuous Commercial Service

TYPE	CLASS	MAXIMUM INPUT POWER vs FREQUENCY						UNITS
		1.6	7.5	15	25	50	75	Mc
5763●	Beam	15	15	15	15	15	15	watts
2E24●	Beam	30	30	30	30	30	30	watts
2E26●	Beam	30	30	30	30	30	30	watts
832-A●	Beam□	36	36	36	36	36	36	watts
807●	Beam	60	60	60	60	50	40	watts
6146●	Beam	67.5	67.5	67.5	67.5	67.5	63	watts
829-B●	Beam□	120	120	120	120	120	120	watts
812-A●	Triode	175	175	175	175	160	130	watts
811-A●	Triode	175	175	175	175	160	130	watts
8005●	Triode	240	240	240	240	195	–	watts
4X150A	Tetrode	250	250	250	250	250	250	watts
813●	Beam	360	360	360	360	300	–	watts
6161	Triode	400	400	400	400	400	400	watts
8000●	Triode	500	500	500	500	400	300	watts
4-125A/ 4D21	Tetrode	500	500	500	500	500	500	watts
5786	Triode	1.5	1.5	1.5	1.5	1.5	1.5	kw
833-A●	Triode	1.8	1.8	1.8	1.75	1.5	1.2	kw
6181	Tetrode	2.5	2.5	2.5	2.5	2.5	2.5	kw
5762	Triode	8.7	8.7	8.7	8.7	8.3★	7.9★	kw
889R-A	Triode	16	16	16	16	12	9.6	kw
6166	Tetrode	18	18	18	18	17.8†	17.7†	kw
892	Triode	30	22.5	17	–	–	–	kw
5771	Triode	67.5	60	60	60	45	–	kw
5671	Triode	100	100	90	80	–	–	kw
5770	Triode	150	150	150	135	–	–	kw

□ Twin Type - Input values per tube for push-pull operation.

● Type may be operated at higher ratings in Intermittent Commercial and Amateur Service (ICAS) as given in published data for each type.

★ For Television Picture Service over the range of 54 Mc. to 216 Mc., the CCS maximum rated input power is 6.5 kw.

† For Television Picture Service over the range of 54 Mc. to 216 Mc., the CCS maximum rated input power is 22 kw.

THYRATRONS

2D21	5560
672-A	5563
2050	*5696*
6012	

IGNITRONS

5551
5552
5553
5822

RECTIFIERS●

2X2-A	857-B
3B28	866-A
5R4-GY	869-B
673	8008

● For additional vacuum-type rectifiers, see listing of types for Receiver Applications.

RCA PREFERRED TUBE TYPES

Miniature Types are shown in italics

VACUUM TYPES FOR RF AND AF POWER APPLICATIONS (Cont'd)

Values shown are Unmodulated Class C Ratings for Continuous Commercial Service

UNITS	MAXIMUM INPUT POWER vs FREQUENCY					CLASS	TYPE
Mc	110	175	220	450	900		
watts	15	15	–	–	–	Beam	*5763*●
watts	30	20	–	–	–	Beam	2E24●
watts	30	20	–	–	–	Beam	2E26●
watts	36	36	34	–	–	Beam□	832-A●
watts	–	–	–	–	–	Beam	807●
watts	56	47	–	–	–	Beam	6146●
watts	120	120	114	–	–	Beam□	829-B●
watts	–	–	–	–	–	Triode	812-A●
watts	–	–	–	–	–	Triode	811-A●
watts	–	–	–	–	–	Triode	8005●
watts	250	250	250	250	–	Tetrode	4X150A
watts	–	–	–	–	–	Beam	813●
watts	400	400	400	400	400	Triode	6161
watts	–	–	–	–	–	Triode	8000●
watts	500	470	390	–	–	Tetrode	4-125A/ 4D21
kw	1.5	1.5	–	–	–	Triode	5786
kw	–	–	–	–	–	Triode	833-A●
kw	2.5	2.5	2.5	2.5	2.5	Tetrode	6181
kw	7.3*	6.1*	4.5*	–	–	Triode	5762
kw	–	–	–	–	–	Triode	889R-A
kw	17.2†	16.5†	16	–	–	Tetrode	6166
kw	–	–	–	–	–	Triode	892
kw	–	–	–	–	–	Triode	5771
kw	–	–	–	–	–	Triode	5671
kw	–	–	–	–	–	Triode	5770

SMALL TYPES FOR INDUSTRIAL AND COMMUNICATION SERVICES

HOME ENTERTAINMENT TYPES OF SPECIAL INTEREST*		VACUUM TYPES FOR CRITICAL APPLICATIONS		TYPES FOR REGULATOR SERVICE	GLOW DISCHARGE TRIODE
6AK6	6L6-G	1620		*0A2*	*5823*
6AQ6	6SC7	5690	"Special Red" Types	*0B2*	
6BJ6	6SL7-GT	5691		*5651*	
6C4	*12AX7*▲	5692		6080	
		5693			
		5879			

* Also see types for AM, FM, & TV Receivers.

▲ Tapped heater, for 6.3-volt or 12.6-volt operation.

RCA PREFERRED TUBE TYPES

Miniature Types are shown in italics

TYPES FOR AM AND FM BROADCAST RECEIVER APPLICATIONS

RECTIFIERS and DIODE DETECTORS	CONVERTERS	AMPLIFIERS, OSCILLATORS, & MIXERS					OUTPUT AMPLIFIERS
		Triodes		Pentodes			
		Twin	With Diodes	Sharp Cutoff	Remote Cutoff	With Diode	
	1R5			*1U4*	*1T4*	*1U5*	*3S4*
							3V4
5U4-G	*6BE6*		*6AV6*	*6AU6*	*6BA6*		*6AQ5*
5Y3-GT	*6X8*			*6CB6*			6K6-GT
6AL5							6V6-GT
6X4							
35W4	*12BE6*	*12AU7*▲	*12AV6*		*12BA6*		*35C5*
							50C5

TYPES FOR TELEVISION RECEIVER APPLICATIONS

RF TUNER TUBES	AMPLIFIERS				DEFLECTION OSCILLATORS	SOUND & VIDEO DETECTOR
	IF	Video	Audio	Deflection		
*6AF4**	*6AU6*	*6AU6*	*6AQ5*	*6S4*	6SN7-GT	*6AL5*
*6BQ7-A**	*6BQ7-A*	*6CL6*	*6AV6*	6BQ6-GT		
6J6	*6CB6*		6K6-GT	6CD6-G		
6X8			6V6-GT	6W6-GT		
					12AU7▲	
					12BH7▲	

RECTIFIERS		DAMPER TUBE	CONTROL CIRCUITS●
High-Voltage	Low-Voltage		
1B3-GT	5U4-G	6AX4-GT	*6AU6*
		6W4-GT	6SN7-GT
			12AU7▲
			12BH7▲

* For UHF.

▲ Tapped heater, for 6.3-volt or 12.6-volt operation.

● Including synchronizing functions, AGC, etc.

RCA PREFERRED TUBE TYPES

Miniature Types are shown in italics

C-R OSCILLOGRAPH TYPES

P1 SCREEN	P7 SCREEN	P11 SCREEN	P14 SCREEN	P16 SCREEN
2BP1		2BP11		
		3KP11		
3JP1*	3JP7*			
3RP1*				
5ABP1*	5ABP7*	5ABP11*		
	5FP7-A		5FP14	
5UP1	5UP7	5UP11		
		5WP11♦		
				5ZP16♠
	7MP7		7MP14	
	10KP7			
	12SP7			
	16ADP7			

♦ Transcriber Type ♠ Flying-Spot Type

* Post-Deflection Accelerator Type

PHOTOTUBES

SINGLE-UNIT		MULTIPLIER
S1 Response	S4 Response	S4 Response
1P40	1P39	931-A
921		5819
922		6199
927		

CAMERA AND TV STUDIO TYPES

5820	Image Orthicon
6198	Vidicon□
2F21	Monoscope

□ Industrial Type

RCA TUBE TYPES NOT RECOMMENDED FOR NEW EQUIPMENT DESIGN

Certain tube types should be avoided in the design of new equipment because they are approaching obsolescence or have limited or dwindling demand. Such RCA types are listed below for the benefit of equipment designers.

RECEIVING TUBE TYPES

0Z4-G	6A8-G	6K7-G	12A8-GT	42
1A5-GT	6A8-GT	6K7-GT	12AH7-GT	43
1C5-GT	6AB5/6N5	6N7	12J5-GT	45
1D8-GT	6AB7	6Q7	12J7-GT	47
1G6-GT	6AC5-GT	6Q7-GT	12K7-GT	56
1LA4	6AF6-G	6R7	12Q7-GT	57
1Q5-GT	6B8	6S7	12SK7-GT	58
1S4	6C6	6SA7-GT	14B8	70L7-GT
1T5-GT	6C8-G	6SB7-Y	14C5	71-A
1-v	6D6	6SF7	14H7	75
5T4	6F5	6SK7-GT	24-A	76
5W4-GT	6F5-GT	6SQ7-GT	25A6	77
5X4-G	6F6-G	6SS7	25W4-GT	78
5Y3-G	6F7	6ST7	25Z5	80
5Y4-G	6G6-G	6SZ7	25Z6	83-v
5Z3	6H6-GT	6U5	26	84/6Z4
6A3	6J7-GT	6U7-G	27	117N7-GT
6A7	6J8-G	6X5	35Z4-GT	117P7-GT
6A8	6K7	7E7	41	117Z6-GT

TRANSMITTING TUBE TYPES

10-Y	801-A	842	861	1619
203-A	803	843	862-A	1623
207	804	846	865	1624
211	830-B	849	893-A	1626
217-C	838	851	893A-R	8012-A
800	841	860	898-A	

CATHODE-RAY TUBE TYPES

2AP1-A	10FP4-A	16KP4	16TP4	905-A
3AP1-A	12KP4-A	16LP4-A	16WP4-A	908-A
3KP4	14CP4	16RP4	902-A	913
5BP1-A	16DP4-A			

(continued on next page)

RCA TUBE TYPES NOT RECOMMENDED FOR NEW EQUIPMENT DESIGN

PHOTOTUBES

923 924

THYRATRONS

629 885

MISCELLANEOUS

2A4-G	2V3-G	874
2C21/1642	559	878
2C22	864	1634

INTERCHANGEABILITY LIST

POWER TUBES, RECTIFIER TUBES, THYRATRONS, IGNITRONS, VOLTAGE REGULATORS, PHOTOTUBES, CATHODE-RAY TUBES, AND SPECIAL TYPES

Direct Replacement Types*

Type to be Replaced	Replace by RCA Type
0A3/VR75	0A3
0C3/VR105	0C3
0D3/VR150	0D3
CE-1(A-D)	868,918
1P32	927
2AP1	2AP1-A
2B4	885
ML-381	2C39-A
3X100A11	2C39-A
ZP572	2C39-A
2X2/879	2X2-A
3-50G2	834
3AP1	3AP1-A
3BP1	3BP1-A
3C45	6130/3C45
3D22	3D22-A
4D21	4-125A/4D21
4-250A	4-250A/5D22
4-400A	4-250A/5D22
5BP1	5BP1-A
5CP1	5CP1-A
5CP7	5CP7-A
5D22	4-250A/5D22
5FP7	5FP7-A
5HP1-A	5BP1-A●
7BP7	7BP7-A
PJ-8	5556
G9	868
BW-11	834
CE-11V(A-D)	917
RK-11	1623
12DP7	12DP7-A
FG-17	5557
CE-20	927
RK-20A	804
CE-21(A-D)	920
CE-23(A-D)	923
PJ-23	868
CE-25(A-D)	927
RK-25	802
RK-25B	802
CE-28(A-D)	928
RK-28	803
RK28A	803
CE-29(A-D)	929,1P39
CE-30(A-D)	930,1P40
CE-30V	925
RK-30	800
FG-32	5558
CE-34	934
RK-39	807
CE-41	921
CE-42	922
RK-44	837
RK-47	814
UH-50	834
R51A	927
CE-55	924
FG-57	5559
RK-57	805
RK-58	838
CE-59	5581
R59A	868,918
R60A	920
HY-61/807	807
R61A	930
CE-64	5583
FG-67	5728/FG-67
VR75-30	0A3
FG-95	5560
CE-98	5582
FG-104	5561
VR105-30	0C3
HF120	211
VR150-30	0D3
WT-210-0001	2D21
WT-210-0003	884
WT-210-0004	2050
WT-210-0006	6H6
WT-210-0008	866-A

* RCA types are direct replacements under all circumstances.
● Direct replacement, except in high-altitude service.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

INTERCHANGEABILITY LIST

Direct Replacement Types* (Cont'd)			
Type to be Replaced	Replace by RCA Type	Type to be Replaced	Replace by RCA Type
WT-210-0009	84/6Z4	WT-210-0084	6N7-GT
WT-210-0011	0C3	WT-210-0085	50B5
WT-210-0012	80	WT-210-0086	833-A
WT-210-0013	5Z3	WT-210-0087	6K8-GT
WT-210-0015	5557	WT-210-0088	6J5-GT
WT-210-0018	0D3	WT-210-0089	6G6-G
WT-210-0019	83	WT-210-0090	6C6
WT-210-0021	6X5	WT-210-0091	0A4-G
WT-210-0025	117Z6-GT	211-D	211
WT-210-0027	872-A	FG-235A	5552
WT-210-0028	3Q5-GT	FG-238B	5555
WT-210-0029	6C5	242A	211
WT-210-0031	902-A	242B	211
WT-210-0037	117L7-GT/ 117M7-GT	WT-245	884
		WT-246	2050
WT-210-0038	172	FG-258A	5553
WT-210-0040	6X4	FG-259B	5554
WT-210-0042	5Y3-GT	WT-261	6H6
WT-210-0044	575-A	WE-261A	835
WT-210-0045	892	WT-262	866-A
WT-210-0048	5U4-G	WT-263	6Z4
WT-210-0052	2AP1-A	WT-269	0C3
WT-210-0053	3AP1-A	WT-270	80
WT-210-0056	5559	WT-270X	5Z3
WT-210-0057	5560	FG-271	5551
WT-210-0058	676	WT-272	5557
WT-210-0060	0Z4	WE-274B	5R4-GY
WT-210-0061	117N7-GT	WT-294	0D3
WT-210-0062	5557	WE-295A	203-A
WT-210-0069	5557	WT-301	83
WT-210-0070	5550	UE-303A	203-A
WT-210-0071	5551	WE-304B	834
WT-210-0072	5552	F-307A	207
WT-210-0073	5553	WT-308	6X5-GT
WT-210-0074	105	CE-309	5557
WT-210-0078	172	CE-311	3C23
WT-210-0079	105	UE-311	211
WT-210-0081	6SJ7	UE-311C	835
WT-210-0082	6V6	UE-317C	217-C
WT-210-0083	7K7	WE-322A	803

* RCA types are direct replacements under all circumstances.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

INTERCHANGEABILITY LIST

Direct Replacement Types* (Cont'd)

Type to be Replaced	Replace by RCA Type	Type to be Replaced	Replace by RCA Type
WE-350A	807	872	872-A
375-A	575-A	872-A/872	872-A
WT-377	117Z6-GT	F-872B	872-A
ML-381	2C39-A	879	2X2-A
WT-389	3Q5-GT	889	889-A
WT-390	6C5	893	893-A
FJ-401	1P29	902	902-A
WE-403A	6AK5	UE-905	805
GL-415	5550	905	905-A
GL-451	8020	906-P1	3AP1-A
ZP-572	2C39-A	908	908-A
WT-606	2D21	914	914-A
WL-630	2050	931	931-A
WL-631	5559	UE-938	838
KU-634	677	UE-949	849
WL-651/656	5552	UE-966A	866-A
WL-652/657	5551	UE-967	5557
WL-653B	5555	UE-972A	872-A
WL-655/658	5553	UE-975A	575-A
672	672-A	1640	6405/1640
678	5563-A	1802-P1	5BP1-A
WL-679	5554	1811-P1	7CP1
WL-681/686	5550	1849	1850-A
NL-715	5557	1850	1850-A
ML-728	5557	1854	6474/1854
WL-735	868	1904	5728/FG-67
801	801-A	2051	2050
811	811-A	2525A5	5BP1-A
812	812-A	5604	5604-A
829	829-B	5814	5814-A
829-A	829-B	8001	4E27/8001
832	832-A	8016	1B3-GT
833	833-A	WTT-100	6X4
C-833	833-A	WTT-102	5Y3-GT
UH-50	834	WTT-103	6H6
857	857-B	WTT-104	575-A
862	862-A	WTT-105	892
866	866-A	WTT-111	5559
866-A/866	866-A	WTT-112	5560
869-A	869-B	WTT-113	676

* RCA types are direct replacements under all circumstances.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

INTERCHANGEABILITY LIST

Direct Replacement Types* (Cont'd)

Type to be Replaced	Replace by RCA Type	Type to be Replaced	Replace by RCA Type
WTT-114	0Z4	WTT-127	833-A
WTT-115	117N7-GT	WTT-128	6K8-GT
WTT-117	5557	WTT-129	6J5-GT
WTT-118	105	WTT-130	6G6-G
WTT-119	172	WTT-131	6C6
WTT-122	6SJ7	WTT-132	0A4-G
WTT-123	6V6	WTT-135	5U4-G
WTT-124	7K7	WTT-136	2AP1-A
WTT-125	6N7-GT	WTT-137	3AP1-A
WTT-126	50B5	WTT-139	172

Similar Types#

Type to be Replaced	Similar RCA Type	Type to be Replaced	Similar RCA Type
CE-1V(A-D)	930,1P40	4X150G	4X150A
CE-2(A-D)	917,919	CE5(A-D)	927
2B22	559	5C24	8000
2C38	2C39-A	5D24	4-250A/5D22
2E25	2E24	6D22	4X500A
2E30	5618	WT-6	6L6
3B27	836	7C20	5762/7C24
3B28	866-A	7C25	5762/7C24
3C21	838	7C27	5762/7C24
3C24	1623	HV-12	806
3-25A3	809	RK-12	809
3-50A4	811-A	CE-13	868
3-75A3	8005	CE-13V	917
3-250A4	806	G-15F	927
3-450A4	833-A	HV-18	806
3-1000A2	8000	FV-20	8000
3-1000A4	810	T-20	1623
3X2500A3	5762/7C24	TV-20	810
4C21	211	TZ-20	809
4C22	8005	PJ-21	5556

* RCA types are direct replacements under all circumstances.

RCA types are not directly interchangeable with the types to be replaced because of mechanical and/or electrical differences. For more information as to degree of interchangeability, refer to respective tube data.

INTERCHANGEABILITY LIST

Similar Types# (Cont'd)

Type to be Replaced	Similar RCA Type	Type to be Replaced	Similar RCA Type
CE-22(A-D)	1P41	HY-57	812-A
PJ-22	917	R-58A	927
X-22	1616	58AWB	927
KU-23	806	59D	929
RK-23	802	CE-60	917
RK-23A	802	HF-60	8005
24-G	808	HY-60	807
HY-25	809	SK-60	868
25T	809	T-60	8005
RK-27	806	R61BV	929
FG-27A	5559	RK-63	806
HY-30Z	809	SK-63	918
CE-31V	919	RK-64	807
FG-33	5728/FG-67	R64AV	925
35T	811-A	HY-69	1624
35TG	808	V-70-D	8005
CE-36(A-D)	927	R71A	930,1P40
RK-36	806	R71AV	925
RK-37	808	71D	929
RK-38	806	FP-85	8020
HY-40	812-A	FP-85A	8020
T-40	812-A	R85A	928
TZ-40	811-A	CE-91R	1P37
HY-40Z	811-A	HF-100	8005
RK-41	807	100R	8020
RK-46	804	100TH	810
RK87	814	100TL	8000
RK-48A	813	111-H	812-A
SR-50	917	ZB-120	838
HY-51A	830-B	F123A	806
HY-51B	830-B	HF-125	8005
HY-51Z	838	T-125	810
RK-51	830-B	F-127A	810
SR-51	926	F-128A	851
RK-52	811-A	HF-130	835
53AWB	927	HF-140	211
SR-53	917	143D	2X2-A
HK-54	808	GL-146	805
54-XH	3AP1-A	AB-150	845
T-55	8005	TW-150	810

RCA types are not directly interchangeable with the types to be replaced because of mechanical and/or electrical differences. For more information as to degree of interchangeability, refer to respective tube data.

INTERCHANGEABILITY LIST

Similar Types# (Cont'd)

Type to be Replaced	Similar RCA Type	Type to be Replaced	Similar RCA Type
150P	803	HK-254	810
150T	806	WE-254B	865
152TH	806	WE-255B	869-B
152TL	806	HF-258B	866-A
GL-152	805	WE-259A	24-A
HK-154	808	260A	860
T-155	806	HF-261A	835
C-200	810	WE-264A	864
HF-200	8000	WE-264B,C	864
T-200	806	266B	857-B
C-201	805	WE-266C	857-B
C-202	805	WE-267B	872-A
HD-203A	805	WE-268A	801-A
HD-203C	805	WE-271A	843
HF-203H	8003	WE-274A	5R4-GY
WE-205D	10-Y	WE-281A	46
WE-205E	10-Y	T-282A	8000
WT-210-0007	6L6	WE-284B	845
WT-210-0067	3C23	WE-284D	845
211B	211	WE-287A	5557
211C	835	WE-298A	862-A
HD-211C	805	300	806
211E	835	WE-301A	83
212E	849	T-303C	8000
WE-214E	217-C	UE-303U	8000
WE-217-A	80	UE-304A	204-A
WE-220C	892	WE-304B	6AK5
Z-225	866-A	CE-306	676
WE-231D	864	WE-307A	807
WE-241B	833-A	UE-310	801-A
WE-242C	211	WE-310A	6C6
T-249B	866-A	UE-311CH	8000
WE-249A	866-A	UE-311T	8003
WE-249B	866-A	UE-311CT	8003
250TH	810	WE-312A	828
250TL	806	315A	673
HF-250	8000	319A	872-A
WE-251A	851	321A	673
WE-252A	842	323B	3C23
HK-253	217-C	WE-339A	807

\# RCA types are not directly interchangeable with the types to be replaced because of mechanical and/or electrical differences. For more information as to degree of interchangeability, refer to respective tube data.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

INTERCHANGEABILITY LIST

Similar Types# (Cont'd)

Type to be Replaced	Similar RCA Type	Type to be Replaced	Similar RCA Type
WE-341AA	891-R	678	5563-A
F-342A	858	NL-710	676
343A	858	NL-714	5557
WE-348A	1620	WL-734	917
C-350	807	WL-739	927
WE-350B	807	WL-741	923
353A	872-A	T-756	809
HK-354C	806	UE-812H	8005
HK-354D	806	T-814	806
HK-354E	806	T-822	806
HK-354F	806	825	1623
ML-356	5771	C-849A	833-A
WE-356A	808	C-849H	833-A
WE-357A	833-A	F-857A	857-B
F-357A	857-B	861-A	861
WE-359A	1C21	863	892
WE-361A	835	866-B	866-A
F-363A	892	C-872	872-A
F-367A	673	UE-911CH	835
F-369B	869-B	UE-942	842
F-376A	835	NL-1005	5551
WE-393A	3C23	1603	1620,5879
WE-394A	627	1816-P4A	10FP4-A
WE-395A	5823	1847	5527
FJ-405	935	1851	6AC7
WL-450	833-A	1899	2F21
WL-460	806	2501-A3	3AP1-A
WL-463	806	2501-C3	908-A
UE-468	8000	5514	811-A
WL-468	810	5516	2E24
WL-471	8003	5591	6AK5
WL-473	5762/7C24	5604	889R-A
WL-481	8013-A	5606	892
RH-507	1949	5654	6AK5
DRJ-524	864	5658	880
GL-546	5696	5663	5696
578	8020	5666	889-A
NL-615	5558	5667	889R-A
WL-632A	5560	5668	892
WL-632B	5560	5669	892-R

\# RCA types are not directly interchangeable with the types to be replaced because of mechanical and/or electrical differences. For more information as to degree of interchangeability, refer to respective tube data.

INTERCHANGEABILITY LIST

Similar Types# (Cont'd)

Type to be Replaced	Similar RCA Type	Type to be Replaced	Similar RCA Type
5685/C6J	676	6336	6080
5686	5763	6346	5551
5695	816	6347	5552
5720/FG-33	5728/FG-67	6348	5553
5725	6AS6	6394	6082
5736	5726/7C24	6445	892-R
5788	5555	6446	892
5891	5671	6447	892-R
5918	5770	6626	6073
5934	579-B	6627	6074
5959	6130/3C45	AX9911	6130/3C45
6140/423A	5651		
6155	4D21/4-125A		
6156	4-250A/5D22		
6333	892		

RCA types are not directly interchangeable with the types to be replaced because of mechanical and/or electrical differences. For more information as to degree of interchangeability, refer to respective tube data.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RATING SYSTEMS
for Electron Devices

Three Rating Systems are in use by the Electron-Device Industry. The oldest is known as the Absolute-Maximum System, the next as the Design-Center System, and the latest and newest is the Design-Maximum System. Definitions of these systems have been formulated by the Joint Electron Tube Engineering Council (JETEC)—now identified as the Joint Electron Device Engineering Council (JEDEC)—and standardized by National Electrical Manufacturers Association (NEMA) and Electronic Industries Association (EIA) as follows:

Absolute-Maximum Rating System

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment-component variation, equipment-control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

Design-Center Rating System

Design-Center ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply-voltage variation*, equipment-component variation, equipment-control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

The equipment manufacturer should design so that initially no Design-Center value for the intended service is exceeded with a bogey device in equipment operating at the stated normal supply voltage*.

* For an ac power source, 117 volts plus or minus 10 per cent is accepted USA practice.

RATING SYSTEMS

for Electron Devices

Design-Maximum Rating System

Design-Maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Design-Maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment-component variation, equipment-control adjustment, load variation, signal variation, and environmental conditions.

Differences Between Systems

The significant differences between the three Rating Systems can be summarized as follows:

Absolute-Maximum System:

$$\text{Ratings} = \left[\begin{array}{c}\text{Maximum capa-}\\ \text{bilities of}\\ \text{any electron}\\ \text{device of the}\\ \text{type rated}\end{array}\right]$$

Design-Center System:

$$\text{Ratings} = \left[\begin{array}{c}\text{Maximum capa-}\\ \text{bilities of}\\ \text{any electron}\\ \text{device of the}\\ \text{type rated}\end{array}\right] - \left[\begin{array}{c}\text{Allow-}\\ \text{ance for}\\ \text{electron-}\\ \text{device}\\ \text{variations}\end{array}\right] - \left[\begin{array}{c}\text{Allowance}\\ \text{for}\\ \text{component}\\ \text{and supply}\\ \text{variations}\end{array}\right]$$

Design-Maximum System:

$$\text{Ratings} = \left[\begin{array}{c}\text{Maximum capa-}\\ \text{bilities of}\\ \text{any electron}\\ \text{device of the}\\ \text{type rated}\end{array}\right] - \left[\begin{array}{c}\text{Allow-}\\ \text{ance for}\\ \text{electron-}\\ \text{device}\\ \text{variations}\end{array}\right]$$

TUBE RATINGS

AND THEIR SIGNIFICANCE

A rating is a designation, as established by definite standards, of an operating limit of a tube. Tubes are rated by either of two systems, i.e., the "absolute maximum" system or the "design-center maximum" system. Of the two, the absolute maximum system is the older and dates back to the beginning of tubes. With either system, each maximum rating for a given tube type must be considered in relation to all other maximum ratings for that type, so that no one maximum rating will be exceeded in utilizing any other maximum rating. For convenience in referring to these two systems, the former will hereinafter be called the "absolute system," and the latter, the "design-center system."

In the **absolute system,*** the maximum ratings shown for each type thus rated are limiting values above which the serviceability of the tube may be impaired from the viewpoint of life and satisfactory performance. Therefore, in order not to exceed these absolute ratings, the equipment designer has the responsibility of determining an average design value for each rating below the absolute value of that rating by an amount such that the absolute values will never be exceeded under any usual condition of supply-voltage variation, load variation, or manufacturing variation in the equipment itself.

The equipment should be designed to operate the filament or heater of each tube type at rated normal value for full-load operating conditions under average voltage-supply conditions. Variations from this normal value due to voltage-supply fluctuation or other causes, should not exceed ±5 per cent unless otherwise specified by the tube manufacturer.

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* Types rated according to the **absolute system** have no identification on their data pages issued prior to April 1, 1942. Sheets issued after that date carry the statement "Maximum Ratings Are Absolute Values" preceding the ratings.

TUBE RATINGS

(continued from preceding page)

In the **design-center system**** adopted by the receiving-tube industry late in 1939, the maximum ratings shown for each type thus rated are working design-center maximums. The basic purpose underlying this system is to provide satisfactory average performance in the greatest number of equipments on the premise that they will not be adjusted to local power-supply conditions at time of installation. In the setting up of design-center ratings, consideration has been given to three important kinds of power supply commonly in use, i.e., a-c and d-c power lines, storage battery with connected charger, and dry batteries.

In the case of a-c or d-c power lines, the maximum ratings for tubes rated according to the design-center system have been chosen so that the tubes will give satisfactory performance at these maximum ratings in equipment operated from power-line supplies whose normal voltage including normal variations fall within ±10 per cent of a specified center value. In other words, it is basic to the design-center system of ratings for tubes operated from power-line supplies that filaments or heaters as well as positive- and negative-potential electrodes may have to operate at voltages differing as much as ±10 per cent from their rated values. It also recognizes that equipment may occasionally be used on power-line supplies outside the normal range, but since such extreme cases are the exception, they should be handled by adjustment made locally.

The choice of ±10 per cent takes care of voltage differences in power lines in the U.S.A. where surveys have shown that the voltages delivered fall within ±10 per cent of 117 volts. Therefore, satisfactory performance from tubes rated according to the design-center system will ordinarily be obtained

** Types rated according to the **design-center system** are identified on their data pages either by a large star in the index corner or by the statement "Maximum Ratings Are Design-Center Values" preceding the ratings. This statement is used on sheets issued since April 1, 1942.

TUBE RATINGS

(continued from preceding page)

anywhere in the U.S.A. in equipment designed so that the design-center maximum ratings are not exceeded at a line-voltage-center value of 117 volts. While 117 volts represents present-day conditions, the design-center system permits the utilization of a new line-center value as new surveys may indicate the necessity for such a change.

In the case of storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. This fluctuation imposes severe operating conditions on tubes. Under these conditions, latitude for operation of tubes is provided for by the stipulation that only 90 per cent of the design-center maximum values of plate voltages, screen-supply voltages, dissipations, and rectifier output currents is never exceeded for a terminal potential at the battery source of 2.2 volts per cell. While a tube's operating voltages in this service will at times exceed the maximum values, satisfactory performance with probable sacrifice in life will be obtained.

In the cases of dry-battery supply and rectified a-c supply for 1.4-volt tubes, recommended design practice is given in RMA Standard M8-210.

RMA Standard M8-210 (Jan. 8, 1940 Rev. 11-40) is reproduced here for the convenient reference of design engineers with permission of the Engineering Department of the Radio Manufacturers Association. Although worded to cover only receiving tubes, it can be applied to any tube having design-center-system ratings.

* * *

It shall be standard to interpret the ratings on receiving types of tubes according to the following conditions:

1. CATHODE—The heater or filament voltage is given as a normal value unless otherwise stated. This means that transformers or resistances in the heater or filament circuit should be designed to op-

TUBE RATINGS

(continued from preceding page)

erate the heater or filament at rated value for full-load operating conditions under average supply-voltage conditions. A reasonable amount of leeway is incorporated in the cathode design so that moderate fluctuations of heater or filament voltage downward will not cause marked falling off in response; also, moderate voltage fluctuations upward will not reduce the life of the cathode to an unsatisfactory degree.

A. 1.4-Volt Battery Tube Types—The filament power supply may be obtained from dry-cell batteries, from storage batteries, or from a power line. With dry-cell battery supply, the filament may be connected either directly across a battery rated at a terminal potential of 1.5 volts, or in series with the filaments of similar tubes across a power supply consisting of dry cells in series. In either case, the voltage across each 1.4-volt section of filament should not exceed 1.6 volts. With power-line or storage-battery supply, the filament may be operated in series with the filaments of similar tubes. For such operation, design adjustments should be made so that, with tubes of rated characteristics, operating with all electrode voltages applied and on a normal line voltage of 117 volts or on a normal storage-battery voltage of 2.0 volts per cell (without a charger) or 2.2 volts per cell (with a charger), the voltage drop across each 1.4-volt section of filament will be maintained within a range of 1.25 to 1.4 volts with a nominal center of 1.3 volts. In order to meet the recommended conditions for operating filaments in series from dry-battery, storage-battery, or power-line sources it may be necessary to use shunting resistors across the individual 1.4-volt sections of filament.

B. 2.0-Volt Battery Tube Types—The 2.0-volt line of tubes is designed to be operated with 2.0 volts across the filament. In all cases the operat-

TUBE RATINGS

(continued from preceding page)

ing voltage range should be maintained within the limits of 1.8 volts to 2.2 volts.

2. POSITIVE POTENTIAL ELECTRODES—The power sources for the operation of radio equipment are subject to variations in their terminal potential. Consequently, the maximum ratings shown on the tube-type data sheets have been established for certain Design Center Voltages which experience has shown to be representative. The Design Center Voltages to be used for the various power supplies together with other rating considerations are as given below:

A. AC or DC Power Line Service in U.S.A.—The design center voltage for this type of power supply is 117 volts. The maximum ratings of plate voltages, screen-supply voltages, dissipations, and rectifier output currents are design maximums and should not be exceeded in equipment operated at a line voltage of 117 volts.

B. Storage-Battery Service—When storage-battery equipment is operated without a charger, it should be designed so that the published maximum values of plate voltages, screen-supply voltages, dissipations, and rectifier output currents are never exceeded for a terminal potential at the battery source of 2.0 volts per cell. When storage-battery equipment is operated with a charger, it should be designed so that 90% of the same maximum values is never exceeded for a terminal potential at the battery source of 2.2 volts.

C. "B"-Battery Service—The design center voltage for "B" batteries is the normal voltage rating of the battery block, such as 45 volts, 90 volts, etc. Equipment should be designed so that under no condition of battery voltage will the plate voltages, the screen-supply voltages, or dissipations ever exceed the recommended respective maximum values shown in the data for each tube type by more than 10%.

TUBE RATINGS

(continued from preceding page)

D. Other Considerations

a. Class A_1 Amplifiers—The maximum plate dissipation occurs at the "Zero-Signal" condition. The maximum screen dissipation usually occurs at the condition where the peak-input signal voltage is equal to the bias voltage.

b. Class B Amplifiers—The maximum plate dissipation theoretically occurs at approximately 63% of the "Maximum-Signal" condition, but practically may occur at any signal voltage value.

c. Converters—The maximum plate dissipation occurs at the "Zero-Signal" condition and the frequency at which the oscillator-developed bias is a minimum. The screen dissipation for any reasonable variation in signal voltage must never exceed the rated value by more than 10%.

d. Screen Ratings—When the screen voltage is supplied through a series voltage-dropping resistor, the maximum screen voltage rating may be exceeded, provided the maximum screen dissipation rating is not exceeded at any signal condition, and the maximum screen voltage rating is not exceeded at the maximum-signal condition. Provided these conditions are fulfilled, the screen-supply voltage may be as high as, but not above, the maximum plate voltage rating.

3. TYPICAL OPERATION — For many receiving tubes, the data show typical operating conditions in particular services. These typical operating values are given to show concisely some guiding information for the use of each type. They are not to be considered as ratings, because the tube can be used under any suitable conditions within its rating limitations.

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TUBE RATINGS

(continued from preceding page)

RECEIVING TUBES

The ratings of all receiving tubes currently used in new equipment are set up according to the design-center system. Older and obsolescent types of receiving tubes still have absolute maximum ratings because these types are used only for renewal purposes and, therefore, design-center values are of no practical value. **Receiving-tube types rated on the design-center system are identified in the Receiving-Tube Section either by a large star in the index corner of each data page or by the statement "Maximum Ratings Are Design-Center Values" preceding the ratings on each data page.**

TRANSMITTING TUBES

The ratings of transmitting tubes grouped in the Transmitting-Tube Section are on the basis of the absolute system. This system enables the transmitter design engineer to choose his design values so as to obtain maximum performance within the tube ratings. Such design procedure has been considered practical for large transmitters where adequate controls are usually incorporated in the design, and ordinarily an experienced operator is present to make any necessary adjustments.

The maximum ratings given for each transmitting type on its data pages apply only when the type is operated at frequencies lower than some specified value which depends on the design of the type. As the frequency is raised above the specified value, the radio-frequency currents, dielectric losses, and heating effects increase rapidly. Most types can be operated above their specified maximum frequency provided the plate voltage and plate input are reduced in accordance with the information given in the table "Transmitting-Tube Ratings vs Operating Frequency" in the front part of the Transmitting-Tube Section.

For certain air-cooled transmitting tubes, two sets

TUBE RATINGS

(continued from preceding page)

of absolute maximum values are shown to meet diversified design requirements. One set is designated as CCS (Continuous Commercial Service) ratings, while the other is called ICAS (Intermittent Commercial and Amateur Service) ratings.

Continuous Commercial Service is defined as that type of service in which long tube life and reliability of performance under continuous operating conditions are the prime consideration. To meet these requirements, the CCS ratings have been established.

Intermittent Commercial and Amateur Service is defined to include the many applications where the transmitter design factors of minimum size, light weight, and maximum power output are more important than long tube life. These various factors have been taken into account in establishing the ICAS ratings.

Under the ICAS classification are such applications as the use of tubes in amateur transmitters, and the use of tubes in equipment where transmissions are of an intermittent nature. The term "intermittent" is used to identify operating conditions in all applications other than amateur in which no operating or "on" period exceeds 5 minutes and every "on" period is followed by an "off" or standby period of at least the same or greater duration.

ICAS ratings are considerably higher than CCS ratings. They permit the handling of greater power, but tube life under ICAS conditions, of course, is reduced. However, the transmitter designer may very properly decide that a small tube operated with ICAS ratings better meets his requirements than a larger tube operated with CCS ratings. Although such use involves some sacrifice in tube life, the period over which tubes will continue to give satisfactory performance in intermittent service can be extremely long depending on the exact nature of the service.

TUBE RATINGS

(continued from preceding page)

The choice of tube operating conditions best fitted for any particular application should be based on a careful consideration of all pertinent factors.

RECTIFIER TUBES

Rectifier tubes used principally in receiving equipment are rated according to the design-center system, while those used primarily in transmitting and laboratory equipment are rated according to the absolute system. The method of identifying which rating system is used for any rectifier tube in this Handbook is the same as that for other tubes in the particular section of the Handbook in which data for the rectifier tube are given.

The ratings of rectifier tubes are based on fundamental limitations in the operation of the tubes themselves, and in general include the following: maximum peak inverse plate voltage, maximum peak plate current, and maximum d-c output current.

Maximum peak inverse plate voltage is the highest instantaneous plate voltage which the tube can withstand recurrently in the direction opposite to that in which it is designed to pass current. For mercury-vapor tubes and gas-filled tubes, it is the safe top value to prevent arc-back in the tube operating within the specified temperature range.

In determining peak inverse plate voltage on a rectifier tube in a particular circuit, the equipment designer should remember that the relations between peak value of inverse plate voltage, rms value of input voltage, and average value of output voltage, depend largely on the characteristics of the particular rectifier circuit and the power supply. Furthermore, the presence of transients, such as line surges and keying surges, or waveform distortion, may raise the actual inverse plate voltage to a peak higher than that calculated for sine-wave voltages. Therefore, the actual inverse plate voltage on a rectifier tube should never exceed the maximum peak inverse plate voltage rating for that tube. The peak inverse plate voltage may be determined with an electronic peak voltmeter of the self-contained battery type.

In single-phase, full-wave rectifier circuits with sine-wave input and pure resistance load, the peak inverse plate voltage is approximately 1.4 times the rms value of the plate-to-plate voltage supply. In single-phase, half-wave circuits with sine-wave input and pure resistance load, the peak inverse plate voltage is approximately 1.4 times the rms value of the plate voltage supply, but with condenser input to filter, the peak inverse plate voltage may be as high as 2.8 times the rms value of the plate voltage supply.

Maximum peak plate current is the highest instantaneous plate current that a tube can safely carry recurrently in the direction of normal current flow. The safe value of this peak current in hot-cathode types of rectifier tubes is a function of the electron emission available and the duration of the pulsating current flow from the rectifier tube in each half-cycle.

The value of peak plate current in a given rectifier circuit is largely determined by filter constants. If a large choke is used at the filter input, the peak plate current is not much greater than the load current; but if a large condenser is used at the filter input, the peak current may be many times the load current. In order to determine accurately the peak plate current in any rectifier circuit, the designer should measure it with a peak-indicating meter or use an oscillograph.

Maximum d-c output current is the highest average plate current which can be handled continuously by a rectifier tube. Its value for any rectifier tube type is based on the permissible plate dissipation of that type. Under operating conditions involving a rapidly

TUBE RATINGS

(continued from preceding page)

repeating duty cycle (steady load), the average plate current may be measured with a d-c meter. In the case of certain mercury-vapor tubes where the load is fluctuating, it is necessary to determine the average current over the time interval specified on the data pages for these types.

In addition to the above ratings for rectifier tubes, other ratings may be set up for a rectifier tube when the service in which the tube is to be used makes such ratings essential for satisfactory performance. Such ratings are: maximum surge plate current, and maximum heater-cathode potential.

Maximum surge plate current is the highest value of abnormal peak currents of short duration that should pass through the rectifier tube under the most adverse conditions of service. This value is intended to assist the equipment designer in a choice of circuit components such that the tube will not be subjected to disastrous currents under abnormal service conditions approximating a short circuit. This surge-current rating is not intended for use under normal operating conditions because subjecting the tube to the maximum surge current even only once may impair tube life. If the tube is subjected to repeated surge currents, its life will be seriously reduced or even terminated.

Maximum heater-cathode potential is the highest instantaneous value of voltage that a rectifier tube can safely stand between its heater and cathode. This rating is applied to certain rectifier tubes having a separate cathode terminal and used in applications where excessive potential may be introduced between heater and cathode. For convenience, this rating is usually given as a d-c value.

CATHODE-RAY TUBES

The ratings of some cathode-ray tubes are set up on the absolute system while others are set up on the design-center system. Initially, cathode-ray tubes

TUBE RATINGS

(continued from preceding page)

were all rated according to the absolute system. With the advent of television which presented design conditions similar to those in the receiving-set field, the method of rating popular types of cathode-ray tubes was changed to the design-center system. More recently, because of procedure standardized by the RMA Cathode-Ray-Tube Committee, newer types of cathode-ray tubes are being rated on the absolute system. **Cathode-ray types rated according to the design-center system are identified in the Cathode-Ray Types Section by a statement to that effect just ahead of the maximum ratings on each data page. The data pages of types rated according to the absolute system have either (1) no identifying statement as to the rating system, or (2) an identifying statement that the ratings are according to the absolute system.**

PHOTOTUBES

The ratings of all phototubes in the Phototube Section are on the absolute maximum basis. This basis enables the designing engineer to choose design values so as to obtain optimum performance within tube ratings. In the case of gas phototubes, the value to which the plate voltage and the plate current can be raised is abruptly limited by ionization effects. If these are allowed to occur, they may ruin the photosurface almost instantly. While phototubes in general might be rated on the design-center basis, such a procedure, with provision for an adequate factor of safety to take care of all conditions of operation, would impose undue limitations on the use of gas phototubes.

MISCELLANEOUS SPECIAL TUBES

The ratings of some of the various tube types grouped in the Miscellaneous-Types Section are according to the design-center system while others are according to the absolute system. **Miscellaneous types rated on the design-center basis are identified**

by a statement to that effect on the data pages or else refer back for ratings to a receiving-tube type whose rating basis is explained under TUBE RATINGS—Receiving Tubes. The data pages of types rated according to the absolute system have either (1) no identifying statement as to the rating system, or (2) an identifying statement that the ratings are according to the absolute system.

CHARACTERISTICS and TYPICAL OPERATING CONDITIONS

In addition to showing the ratings of each tube type, the data pages for many of the types in this Handbook include "characteristics," such as amplification factor, plate resistance, and transconductance, which help to distinguish between the electrical features of the respective types. Usually, the characteristics shown for any type are obtained for that type in class A service: where class A data are given for the type, the characteristics are included with that data for convenience. Based on a large number of tubes of a given type, the values shown for these characteristics are average values.

Range of Characteristics—The equipment designer should bear in mind that individual tubes of a given type may have characteristics values either side of the average values shown for the type. He should also realize that these characteristics change during the life of individual tubes. In designing equipment, therefore, he should allow for the maximum cumulative variation of any characteristic from the average value of that characteristic as shown in the tabulated data for the type. The exact percentage of the variation will be different for different types of tubes depending on the design of the tubes and their intended application, but in general the designer should consider a probable plus or minus variation of not less than 30 per cent.

Furthermore, the equipment designer should recog-

TUBE RATINGS

(continued from preceding page)

nize the desirability of designing equipment so that the full range of the operating characteristics of tubes will be utilized. If this practice is not followed, he imposes on the equipment user special replacement problems in that the user will have to select tubes suitable for use in the equipment, and may not be able to obtain the full life capability of such tubes.

Typical Operating Values—Also included on the data pages is information on typical operating conditions for most of the various tubes when used in particular services. These typical operating values are intended to show concisely some guiding information for the use of each type. They must not be considered as ratings because each type can, in general, be used under any suitable conditions within its rating limitations. In referring to these values for transmitting tubes, it should be noted that the power output value is not a rating. It is an approximate tube output, i.e., tube input minus plate loss. Circuit losses must be subtracted from tube output in determining useful output.

Datum Point for Electrode Potentials—In the data for any type in the Handbook, the values for grid bias and positive-potential-electrode voltages are given with reference to a specified datum point as follows. For types having filaments heated with d.c., the negative filament terminal is taken as the datum point to which other electrode voltages are referred. For types having filaments heated with a.c., the mid-point (i.e., the center tap on the filament-transformer secondary, or the mid-point on a resistor shunting the filament) is taken as the datum point. For types having equipotential cathodes indirectly heated, the cathode is taken as the datum point.

Grid Bias vs Filament Excitation—If the filament of any type for which data are given on a d-c basis is to be operated with an a-c supply, the given grid

(continued from preceding page)

bias should be increased by an amount approximately equal to one half the rated filament voltage and be referred to the filament mid-point. Conversely, if it is required to use d-c filament excitation on any filament type for which the data are given on an a-c basis, the grid-bias values as given on the data pages should be decreased by an amount approximately equal to one half the rated filament voltage and be referred to the negative filament terminal instead of the mid-point as in a-c operation.

In practice, the necessity for following this rule depends on circuit conditions and operating requirements. If the bias is relatively small compared with the filament voltage and hum is a consideration, adjustment of the grid bias is ordinarily essential. Conversely, if the bias is relatively large compared with the filament voltage, adjustment of the grid bias may be unnecessary.

When filament excitation of tubes used as Audio Amplifiers is changed from d.c to a.c., the grid return should, in general, be shifted to the mid-point of the filament circuit to minimize hum, and the bias adjusted accordingly. When the excitation is changed from a.c. to d.c., bias adjustment depending on the relative values of bias and filament voltage may be required to provide the full signal-handling capability of the tubes.

When filament excitation of tubes used as R-F Amplifiers is changed, bias adjustment is not required unless the change makes the circuit critical as to hum or signal-handling capability. For example, in class C amplifiers, the bias is usually so large in comparison with the filament voltage that adjustment is generally unnecessary.

Grid Current and Driving Power—The typical values of d-c grid current and driving power shown for triodes and tetrodes in class B r-f service and in class C service are subject to variations depending on the impedance of the load circuit. High-impe-

TUBE RATINGS

(continued from preceding page)

dance load circuits require more grid current and driving power to obtain the desired output. Low-impedance circuits need less grid current and driving power, but plate-circuit efficiency is sacrificed. In comparison, the d-c grid current and driving power shown for beam tubes and pentodes in class B r-f service and in class C service are not as critical to variations in load-circuit conditions. In any event, sufficient grid current should be used so that the stage is "saturated," i.e., so that a small change in grid current results in negligible change in power output. Regardless of the type of tube used, the driving stage should have a tank circuit of good regulation and should be capable of delivering power in excess of the indicated power by a factor of several times.

TYPES OF CATHODES

AND THEIR USE

In electron tubes, a cathode is an electrode which is the primary source of electron or ion emission. There are two broad classes of cathodes, i.e., hot and cold. "Hot cathodes" are defined as cathodes which are heated or otherwise operate at elevated temperature (frequently incandescent) in order to function as emitters. In contrast, "cold cathodes" are defined as cathodes which do not rely on heat or on elevated temperature in order to function as emitters.

HOT CATHODES

Hot cathodes commonly in use in electron tubes are classified as directly heated, indirectly heated, and ionic-heated.

A **directly heated cathode**, or filament-cathode, is a wire or ribbon which is heated by the passage of current through it. It is further classified by identifying the filament material or the electron-emitting material. Such materials in regular use are pure tungsten, thoriated tungsten, and metals coated with alkaline-earth oxides. Each of these materials has distinctive advantages which are utilized in the design of tubes for particular applications.

PURE-TUNGSTEN FILAMENTS are used in certain tubes, especially those for high-voltage transmitting service. Since these filaments must operate at a high temperature of about 2500°C (a dazzling white) to emit sufficient electrons, a relatively large amount of filament power is required. The operating life of these filaments is determined by the rate of tungsten evaporation. Their failure, therefore, occurs through decreased emission or burn-out.

Pure-tungsten filaments give best life performance when they are operated so as to conserve their emitting capability. They are designed with voltage and current ratings in accord with the service expected of the particular tube type. However, in applications where the normal emission at rated voltage is not

TYPES OF CATHODES

(continued from preceding page)

required, the filament can be operated at a somewhat reduced voltage. The extent of the reduction depends on the peak emission requirements of the application as well as on the percentage regulation of the filament voltage. When these are known, the correct operating filament voltage for any tungsten-filament type can be calculated from its filament-emission characteristic. The permissible regulation in transmitters may be checked by reducing the filament voltage (with the transmitter under normal operation) to a value such that reduction in output can just be detected. The filament voltage must then be increased by an amount equivalent to the maximum percentage regulation of the filament-supply voltage and then increased further by approximately 2 per cent to allow for minor variations in emission of individual tubes. It follows that the better the regulation, the less the filament operating voltage and, therefore, the longer the filament life.

It should be noted that a reduction of 5 per cent in the filament voltage applied to tubes with pure-tungsten filaments will approximately double their life. A reduction of 15 per cent will increase the filament life almost tenfold.

During long or frequent standby periods, pure-tungsten-filament tubes may be operated at decreased filament voltage to conserve life. When the average standby time is an appreciable portion of the average duty cycle and is less than 2 hours, it is recommended that the filament voltage of all but the largest types be reduced to 80 per cent of normal; and that for longer periods, the filament power be turned off. For the largest types, such as the 898, it is recommended that the filament voltage be reduced to 80 per cent of normal during standby operation up to 12 hours; and that for longer periods, the filament power be turned off.

For turning on filament power, a filament starter should be used so as to increase the voltage gradually and to limit the high initial rush of current through

TYPES OF CATHODES

(continued from preceding page)

the filament. It is important that the filament current never exceed, even momentarily, a value of more than 150 per cent of normal, unless the tube data specify otherwise. Similarly, as an added precaution, the filament power should be turned off gradually to prevent cooling strains in the filament.

THORIATED-TUNGSTEN FILAMENTS are now used mainly in certain transmitting and special tubes. Thoriated-tungsten filaments are made from tungsten impregnated with thoria. Due to the presence of thorium, these filaments liberate electrons at a more moderate temperature of about 1700°C (a bright yellow), and are, therefore, much more economical of filament power than are pure-tungsten filaments. The operating life of thoriated-tungsten filaments is ordinarily ended by a decrease in electron emission. Decreased emission, however, may be caused by the accidental application of too high filament, screen, or plate voltage. If the over-voltage has not been continued for a long time, the activity of the filament can often be restored by operating the filament at its normal voltage for 10 minutes or longer without plate, screen, or grid voltage. The reactivation process may be accelerated by raising the filament voltage to not higher than 120 per cent of normal value for a few minutes. This reactivation schedule is often effective in restoring the emission of thoriated-tungsten filaments in tubes which have failed after normal service. Sometimes a few hundred hours of additional life may be obtained after reactivation.

The operating voltage of a thoriated-tungsten filament should, in general, be held to within ±5 per cent of its rated value. However, in transmitting applications where the tube is lightly loaded, the filament may be operated on the low side—as much as 5 per cent below normal voltage. As conditions require, the voltage should be increased gradually to maintain output. Toward the end of life, additional service may be obtained by operating the fila-

TYPES OF CATHODES

(continued from preceding page)

ment above its rated voltage. It should be noted that a tube having a thoriated-tungsten filament should never be operated under emission-limited conditions since this type of operation may overheat the tube and cause permanent loss of emission.

During standby periods in transmitting service, thoriated-tungsten filaments may be operated according to the following recommendations to conserve life. For short standbys of less than 15 minutes duration, the filament voltage of all but the largest types should be reduced to 80 per cent of normal; for longer periods, the filament power should be turned off. For the largest types, such as the 827-R and 861, it is recommended that the filament voltage be reduced to 80 per cent of normal during standby operation up to 2 hours; and that for longer periods, the filament power be turned off.

COATED FILAMENTS are used in receiving tubes, certain transmitting tubes, most mercury-vapor rectifiers, and some special tubes. Coated filaments employ a relatively thick coating of alkaline-earth compounds on a metallic base as a source of electronic emission. The metallic base carries the heating current. These filaments operate at a low temperature of about 800°C (a dull red) and require relatively little power to produce a copious supply of electrons.

For proper performance of these types, rated filament voltage should, in general, be applied at the filament terminals. However, when coated-filament, high-vacuum tubes are used in transmitting service with light loading, the filament voltage may be reduced as much as 5 per cent below normal to conserve life. Then, as conditions require, the voltage should be increased gradually to maintain output. Toward the end of life, the gradual increase may be carried above rated filament voltage to obtain additional service. In the case of gas or vapor tubes, it is important that these types be operated, in general, at rated filament voltage. However, if the line regu-

TYPES OF CATHODES

(continued from preceding page)

lation regularly and consistently does not exceed 1 to 2 per cent, it is practical to reduce the filament voltage slightly (not over 5 per cent) with benefit to tube life.

During standby periods of less than 15 minutes, the filament voltage of quick-heating, high-vacuum types, such as the 1616 and 1624, should be reduced to 80 per cent of normal; for longer periods, the filament power should be turned off. In contrast, the voltage of coated filaments in gas or vapor tubes should not be reduced during standbys except under conditions explained in the preceding paragraph. In general, the filament voltage of small and medium types, such as the 866-A/866 and 872-A/872, should be maintained at normal rated value during standbys up to 2 hours; for longer periods, the filament power should be turned off. For large types, such as the 857-B, the filament voltage should be maintained at normal rated value during standbys up to 12 hours; for longer periods, the filament power should be turned off.

After having given normal service or after having been operated at excessive voltage, coated filaments lose their emission. When such is the case, their usefulness may be considered as terminated.

An **indirectly heated cathode**, or heater-cathode, consists of a heater wire enclosed in a thin metal sleeve coated on the outside with electron-emitting material similar to that used for coated filaments. The sleeve is heated by radiation and conduction from the heater through which current is passed. Useful emission does not take place from the heater wire. An important feature of this kind of cathode construction is that the functions of heating and emission can be independent of each other.

HEATER-CATHODES, or unipotential cathodes as they are frequently called, are used in high-vacuum tubes operating at low plate voltage, such as receiv-

TYPES OF CATHODES

(continued from preceding page)

ing tubes, low-power transmitting tubes, and small special tubes. They also find application in mercury-vapor tubes and in cathode-ray tubes. Heater-cathodes, like coated filaments, provide a copious supply of electron emission at low cathode temperature (a dull red).

For proper performance of heater-cathode tubes, rated heater voltage should, in general, be applied at the heater terminals. However, when heater-cathode high-vacuum tubes are used in transmitting service and are lightly loaded, the heater voltage may be reduced as much as 5 per cent below normal to conserve life. As conditions require, the voltage should be increased gradually to maintain output. Toward the end of life, the gradual increase may be carried above rated heater voltage to obtain additional service.

During standby periods of less than 15 minutes, the heater voltage of high-vacuum tubes should be maintained at normal rated value; for longer periods, the heater power should be turned off. In the case of vapor or gas tubes, the heater voltage should be maintained at normal during standby periods up to 12 hours; for longer periods, the heater power should be turned off.

An ionic-heated cathode is one which liberates electrons when it is subjected to intense positive ion bombardment. The bombardment may be so intense as to raise the temperature of the cathode, frequently causing it to become visibly hot. The ionic-heated cathode in radio tubes has found application in gas rectifiers intended primarily for automobile receiver service.

COLD CATHODES

The designation "cold cathode" is commonly used in referring to those cathodes which emit electrons when they are subjected to bombardment by other electrons, ions, or metastable atoms. Cathodes of

TYPES OF CATHODES

(continued from preceding page)

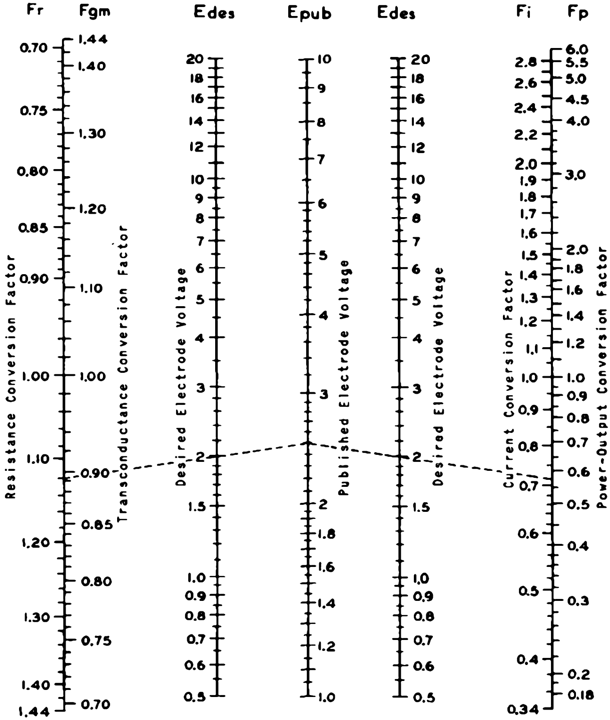
this type are sometimes designated as secondary-emission cathodes. They are used in certain glow-discharge tubes, and also in multiplier phototubes where they contribute to electron multiplication in the successive dynode stages.

Not customarily referred to as cold cathodes, although they are such, is another group of emitters known as photocathodes. By definition, a **photocathode** is one which emits electrons when it is energized with radiant flux, such as light, infra-red radiation, or ultra-violet radiation. Such cathodes are used in phototubes. When used in gas phototubes, these cathodes not only emit under the influence of radiant flux but also as a result of bombardment and thus become partial secondary-emission cathodes.

Photocathodes are classified according to the spectral response characteristics of their respective photoactive surfaces. The S1 photosurface gives high response to red and near infra-red radiation. The S2 photosurface is similar to the S1 surface but extends somewhat further into the infra-red region. The S3 photosurface has a spectral response characteristic which is closest to that of the eye. The S4 photosurface has exceptionally high response to blue and blue-green radiation with negligible response to red radiation.

Exposure of photocathodes to intense light, such as direct sunlight, may decrease the sensitivity of the tubes in which they are used, even though there is no voltage applied. The magnitude and duration of the decrease depend on the length of the exposure. Permanent damage to a phototube may result if it is exposed to radiant energy so intense as to cause excessive heating of the cathode.

CONVERSION FACTORS



CONVERSION FACTOR NOMOGRAPH

The Conversion Factor Nomograph shown above may be used to determine the approximate characteristics of an electron tube when all the electrode voltages are changed in the same proportion from the published or measured values.

The conversion factors obtained from the nomograph are applicable to triodes, tetrodes, pentodes, and beam power tubes when the plate voltage, grid-No.1 voltage, and grid-No.2 voltage are changed simultaneously by the same factor. They may be used for any class of tube operation (class A, AB_1, AB_2, B, or C).

The nomograph may be used to determine the proper value for each conversion factor for a specified relationship (F_e)

CONVERSION FACTORS

between published or measured values (E_{pub}) and desired values (E_{des}) of operating voltage. The dashed lines on the nomograph indicate the correct procedure for determining each of these conversion factors when it is desired to reduce the operating electrode voltage from 250 to 200 volts.

EXAMPLE

Published characteristics for a typical pentode are listed below for a plate voltage of 250 volts. If it is desired to determine the characteristics of this tube for a plate voltage of 200 volts, the voltage conversion factor, F_e, is equal to 200/250 or 0.8. The values for the other conversion factors are obtained from the nomograph. By use of these factors characteristics values at a plate voltage of 200 volts are obtained.

	Published Value	*Conversion Factor*	*Desired Value*	
Plate Voltage	250	0.8	200	volts
Grid-No.2 Voltage	250	0.8	200	volts
Grid-No.1 Voltage	-15	0.8	-12	volts
Plate Current	30	0.72	21.6	ma
Grid-No.2 Current	6	0.72	4.3	ma
Plate Resistance (Approx.). . .	0.13	1.12	0.15	megohm
Transconductance.	2000	0.89	1780	μmhos
Load Resistance	10000	1.12	11200	ohms
Total Harmonic Distortion . . .	10	unchanged	10	%
Max.-Signal Power Output. . . .	2.5	0.57	1.42	watts

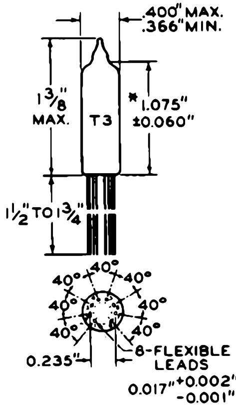
LIMITATIONS

Because this method for conversion of characteristics is necessarily an approximation, progressively greater errors will be introduced as the voltage conversion factor ($F_e = E_{des}/E_{pub}$) departs from unity. In general, it may be assumed that results obtained will be approximately correct when the value of F_e is between 0.7 and 1.5. When F_e is extended beyond these limits (down to 0.5 or up to 2.0), the accuracy becomes considerably reduced and the results obtained can serve only as a rough approximation.

It should be noted that this method does not take into account the effects of contact potential or secondary emission in electron tubes. Contact potential, however, may safely be neglected for most applications because its effects are noticeable only at very low grid-No.1 voltages. Secondary emission may occur in conventional tetrodes at low plate voltages. For such tubes, therefore, the use of conversion factors should be limited to regions of the plate characteristic in which the plate voltage is greater than the grid-No.2 voltage. For beam power tubes, the regions of both low plate currents and low plate voltages should also be avoided.

OUTLINES — Glass Tubes

SUBMINIATURE--Flexible Lead Type



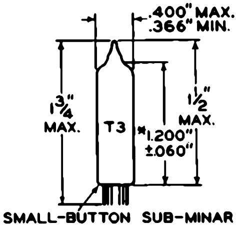
JETEC No.3-1

* Measured from bulb seat to bulb-top line as determined by a ring gauge of 0.210" ± 0.001" I.D.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES — Glass Tubes

SUBMINIATURE--Sub-Minar 8-Pin Base Type

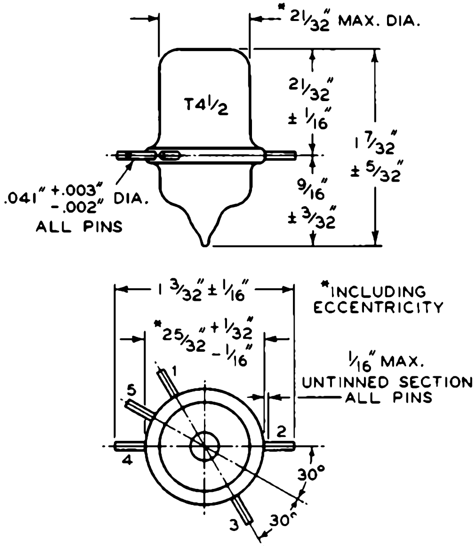


JETEC No.3-5

* Measured from base seat to bulb-top line as determined by a ring gauge of 0.210" ± 0.001" I.D.

OUTLINES—Glass Tubes

ACORN--Radial 5-Pin Base Type



JETEC No.4-1

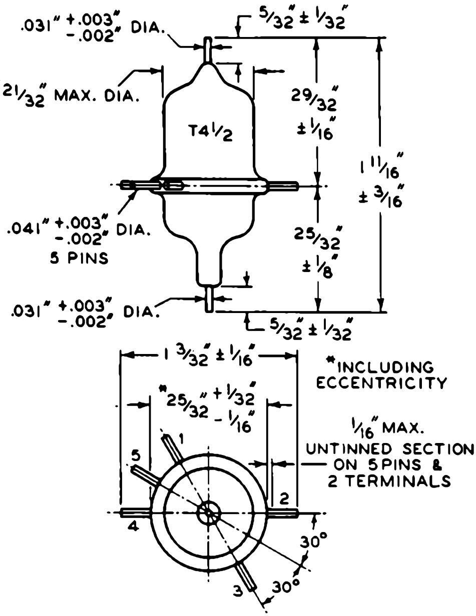
For additional socket design information, see back of "Outlines 3" sheet

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES — Glass Tubes

ACORN--Radial 5-Pin Base Type with End Terminals



JETEC No.4-3

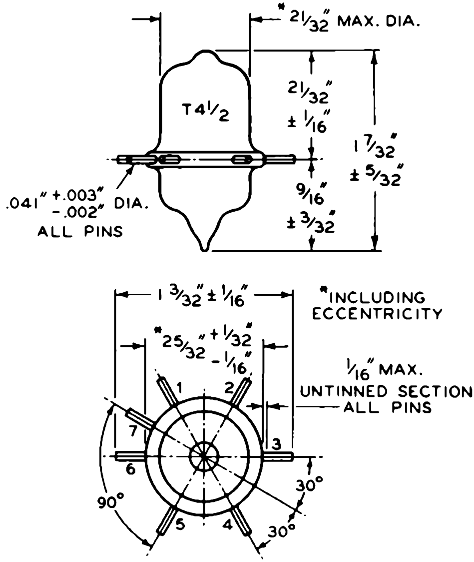
For additional socket design information, see back of "Outlines 3" sheet

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES—Glass Tubes

ACORN--Radial 7-Pin Base Type



JETEC No.4-2

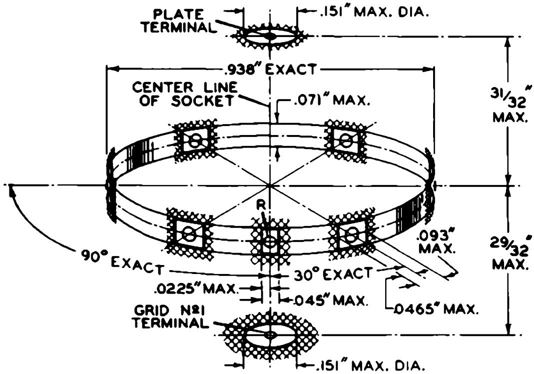
For additional socket design information, see back of this sheet

OUTLINES—Glass Tubes

ACORN TYPES

MAXIMUM PIN AND TERMINAL VARIATIONS AT SOCKET CLIPS AND TERMINAL CONNECTORS

ESSENTIAL DIMENSIONS FOR SOCKET DESIGN



Reference Pin (R)

Base Type	*Pin No.* *
Radial 5-Pin	5
Radial 5-Pin with End Terminals.	5
Radial 7-Pin	7

The above composite diagram shows the ideal positions of radial-pin cross-sections at socket clips located on a circle of 0.938" diameter, as well as end-terminal cross-sections at terminal ends.

The areas within the cross-hatching show actual variations of radial-pin and end-terminal cross-sections, and indicate the maximum variations which socket clips and terminal connectors should accommodate.

The clear area for pin position R is narrower than the others because pin position R is used as a reference for the other pins.

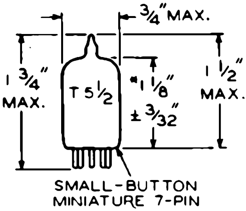
Sockets should be designed so that the maximum diametric clearance between socket clips is never less than 0.850".

* For pin numbering of each of these bases, see respective Dimensional Outline on preceding pages.

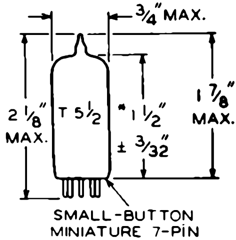
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES—Glass Tubes

MINIATURE--Miniature 7-Pin Base Types



JETEC No.5-1



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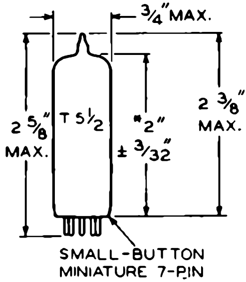


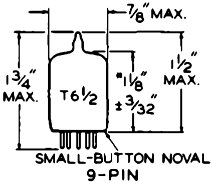
JETEC No.5-3

* Measured from base seat to bulb-top line as determined by ring gauge of 7/16" I.D.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES — Glass Tubes

MINIATURE--Noval 9-Pin Base Types



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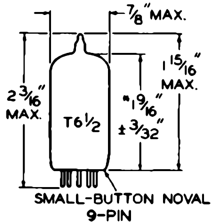

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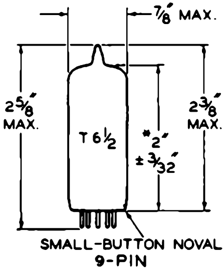
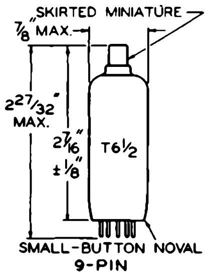


JETEC No. 6-3



JETEC No. 6-7

* Measured from base seat to bulb-top line as determined by ring gauge of 7/16" I.D.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

OUTLINES—Glass Tubes

GLASS OCTAL--Octal Base Types with T9 Bulbs

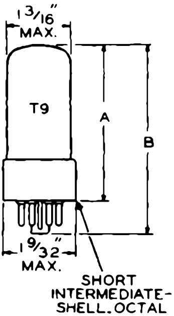


Fig. 1

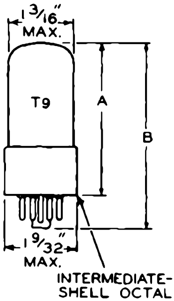


Fig. 2

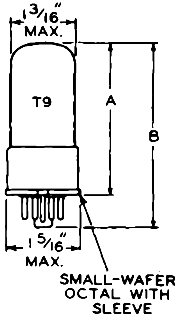
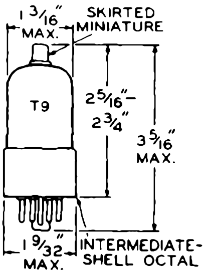
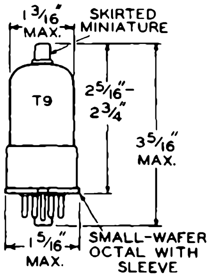


Fig. 3

OUTLINE			DIMENSION	
JETEC No.			A Max. INCHES	B Max. INCHES
Fig. 1	Fig. 2	Fig. 3		
-	9-1	-	1-3/4*	2-5/16
-	9-7	-	2-1/2	3-1/16
9-41	9-11	9-12	2-3/4	3-5/16
-	9-13	-	2-13/16	3-3/8
-	9-15	-	2-7/8	3-7/16
-	9-33	-	3-1/4	3-13/16



JETEC No. 9-17



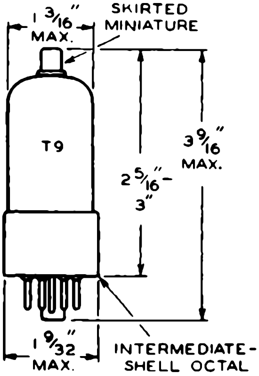
JETEC No. 9-18

* For electron-ray tubes, the seated height is 1-11/16" + 1/16" - 1/4".

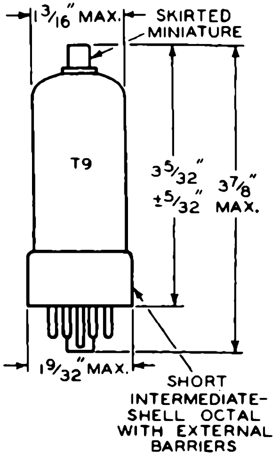
RCA

OUTLINES—Glass Tubes

GLASS OCTAL--Octal Base Types with T9 Bulbs



JETEC No.9-23



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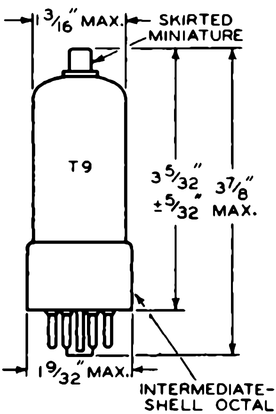

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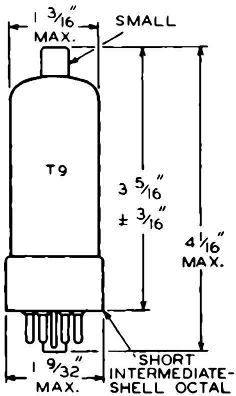
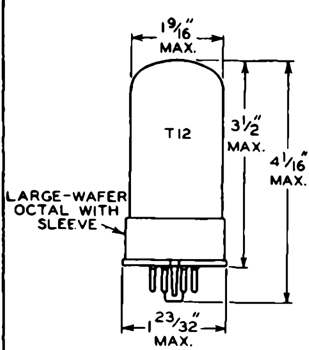


JETEC No.9-51

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES—Glass Tubes

GLASS OCTAL--Octal Base Types with T12 Bulbs



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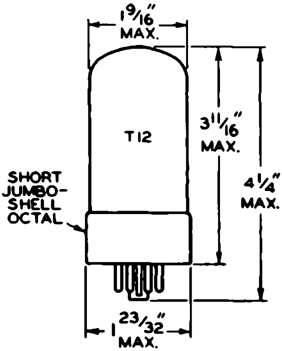

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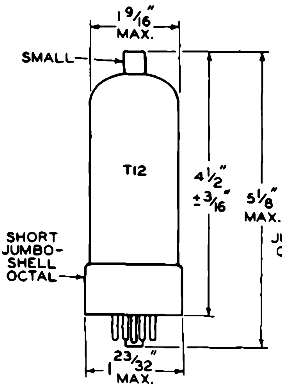

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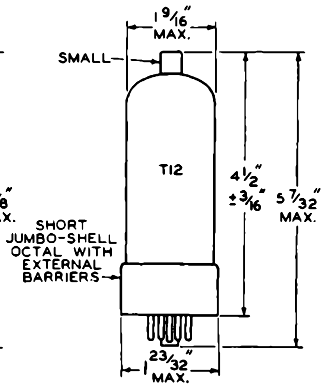


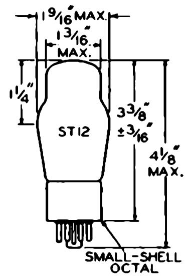
JETEC No. None

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

OUTLINES—Glass Tubes

GLASS OCTAL--Octal Base Types with ST Bulbs



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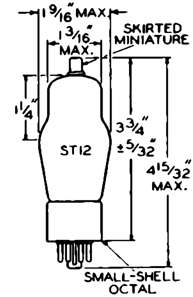

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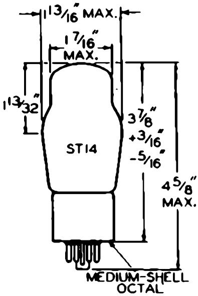
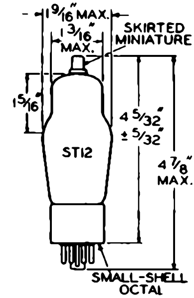


JETEC No. 14-3



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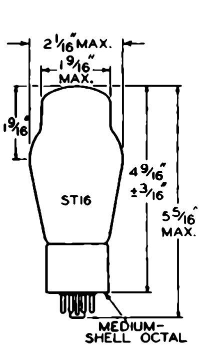

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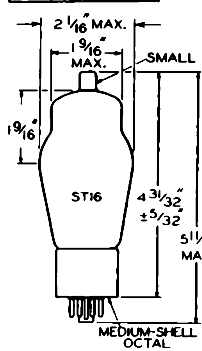
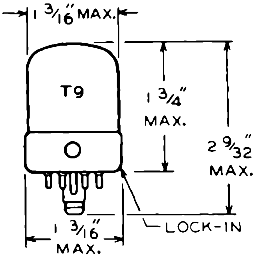


JETEC No. 16-5

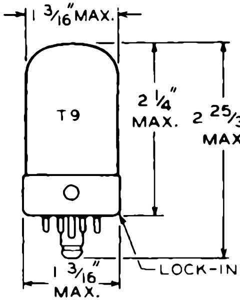
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES—Glass Tubes

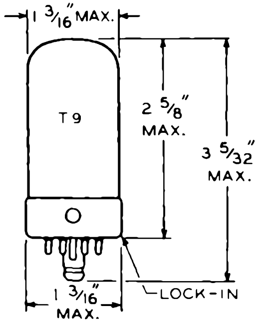
LOCK-IN--Lock-In 8-Pin Base Types



JETEC No.9-32



JETEC No.9-30

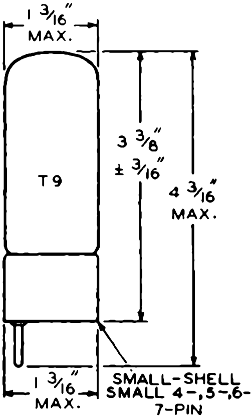


JETEC No.9-31

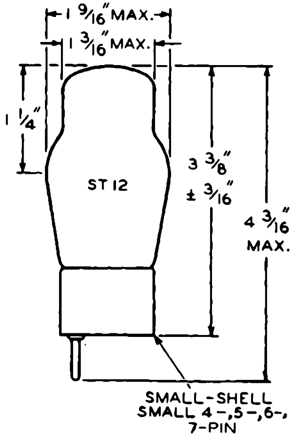
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES—Glass Tubes

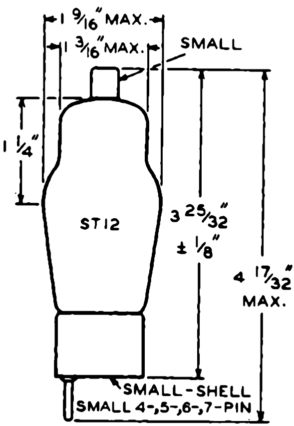
SMALL 4-PIN, SMALL 5-PIN, SMALL 6-PIN, & SMALL 7-PIN BASE TYPES



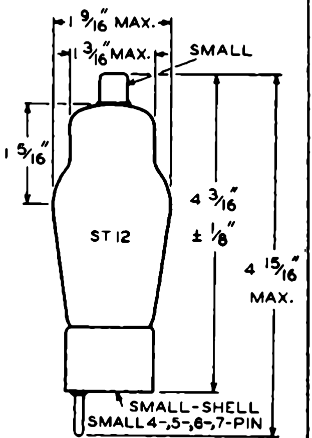
JETEC No.9-26



JETEC No. 12-5



JETEC No. 12-6

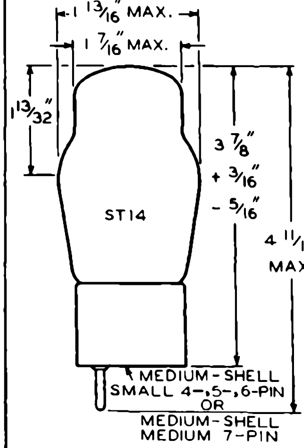


JETEC No. 12-2

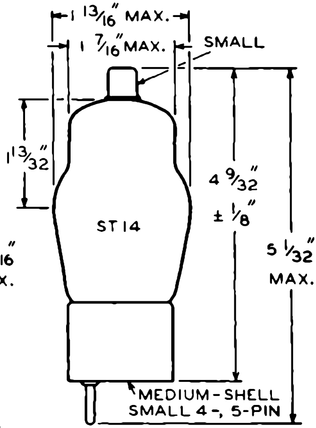
RCA

OUTLINES—Glass Tubes

SMALL 4-PIN, SMALL 5-PIN, SMALL 6-PIN, & MEDIUM 7-PIN BASE TYPES



JETEC No. 14-1



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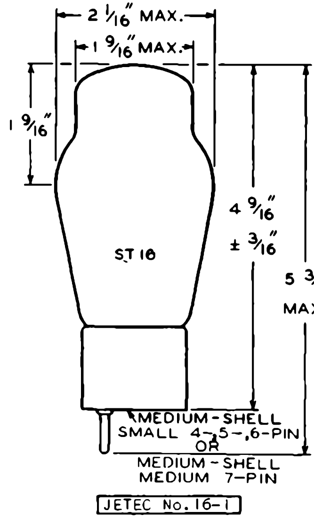


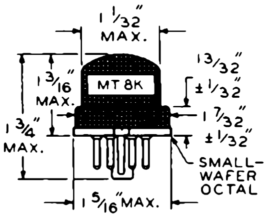
JETEC No. 16-1

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES—Metal Tubes

For correlation of
TUBE TYPE, ENVELOPE DESIGNATION, & OUTLINE No.,
see KEY on back of this sheet



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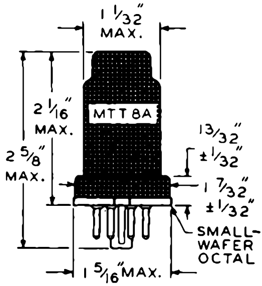

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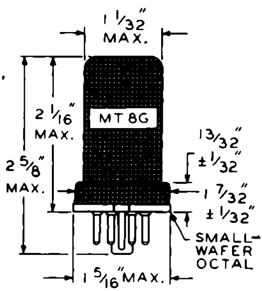
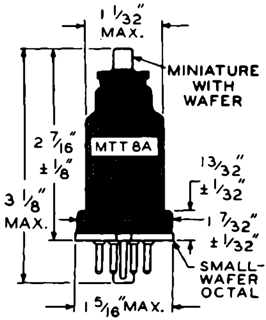


JETEC No.8-1

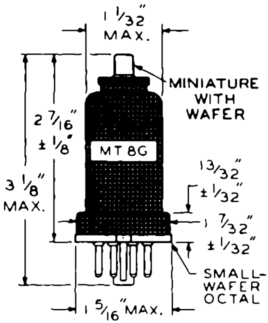


JETEC No.8-4

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES—Metal Tubes

For correlation of
TUBE TYPE, ENVELOPE DESIGNATION, & OUTLINE No.,
see KEY on back of this sheet



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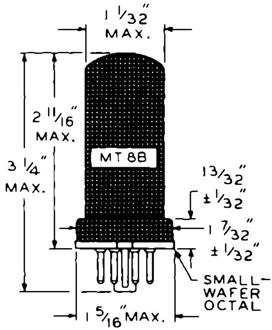

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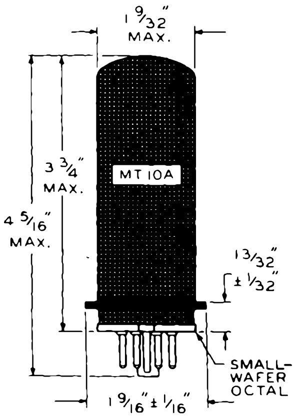


JETEC No.10-1

OUTLINES — Metal Tubes

KEY

Type No.	Envelope Designation	Outline Jetec No.	Type No.	Envelope Designation	Outline Jetec No.
0Z4	MTT8A	8-3	6ST7	MT8G	8-1
5T4	MT10A	10-1	6SZ7	MT8G	8-1
5W4	MT8B	8-6	6V6	MT8B	8-6
5Z4	MT8B	8-6	6X5	MT8B	8-6
6A8	MTT8A	8-4	12A6	MT8B	8-6
6AB7	MT8G	8-1	12C8	MTT8A	8-4
6AC7	MT8G	8-1	12H6	MT8K	8-5
6AG7	MT8B	8-6	12K8	MT8G	8-2
6B8	MTT8A	8-4	12SA7	MT8G	8-1
6C5	MT8G	8-1	12SC7	MT8G	8-1
6F5	MTT8A	8-4	12SF5	MT8G	8-1
6F6	MT8B	8-6	12SF7	MT8G	8-1
6H6	MT8K	8-5	12SG7	MT8G	8-1
6J5	MT8G	8-1	12SH7	MT8G	8-1
6J7	MTT8A	8-4	12SJ7	MT8G	8-1
6K7	MTT8A	8-4	12SK7	MT8G	8-1
6K8	MT8G	8-2	12SQ7	MT8G	8-1
6L6	MT10A	10-1	12SR7	MT8G	8-1
6L7	MTT8A	8-4	12SW7	MT8G	8-1
6N7	MT8B	8-6	12SY7	MT8G	8-1
6Q7	MTT8A	8-4	25A6	MT8B	8-6
6R7	MTT8A	8-4	25L6	MT8B	8-6
6S7	MT8G	8-2	25Z6	MT8B	8-6
6SA7	MT8G	8-1	502-A	MT8G	8-1
6SB7-Y	MT8G	8-1	1611	MT8B	8-6
6SC7	MT8G	8-1	1612	MTT8A	8-4
6SF5	MT8G	8-1	1613	MT8B	8-6
6SF7	MT8G	8-1	1614	MT10A	10-1
6SG7	MT8G	8-1	1619	MT10A	10-1
6SH7	MT8G	8-1	1620	MTT8A	8-4
6SJ7	MT8G	8-1	1621	MT8B	8-6
6SK7	MT8G	8-1	1622	MT10A	10-1
6SQ7	MT8G	8-1	1631	MT10A	10-1
6SR7	MT8G	8-1	1632	MT8B	8-6
6SS7	MT8G	8-1	1634	MT8G	8-1
			5693	MT8G	8-1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

BASES

MINIMUM DIAMETERS

Until such time as the Handbook pages covering bases are re-issued to include minimum diameters of wafers, shells, and sleeves, this provisional sheet will supply these minimum diameters for the following bases to supplement the maximum diameters which are shown on the respective base drawings.

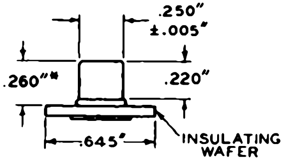
Base		*Minimum Diameter*
3-PIN & 4-PIN TYPES:		
Peewee 3-Pin		0.610"
Small 4-Nub		0.970"
WD 4-Pin		1.097"
Tapered Small 4-Pin		1.136"
Small 4-Pin		1.136"
Medium 4-Pin		1.337"
Medium 4-Pin with Bayonet		1.337"
Jumbo 4-Pin		1.840"
Super-Jumbo 4-Pin		2.177"
5-PIN TYPES:		
Small 5-Pin		1.136"
Medium 5-Pin		1.337"
Giant 5-Pin		2.142"
6-PIN TYPES:		
Small 6-Pin		1.136"
Medium 6-Pin		1.337"
7-PIN TYPES:		
Small 7-Pin		1.136"
Medium 7-Pin		1.337"
Medium 7-Pin with Bayonet		1.337"
Giant 7-Pin		2.146"
8-PIN TYPES:		
Dwarf Shell Octal 8-Pin		1.028"
Dwarf Metal Shell Octal 8-Pin		1.015"
Small Shell Octal 8-Pin		1.136"
Intermediate Shell Octal 8-Pin		1.235"
Small Wafer Octal 8-Pin		1.271"
with Sleeve No. R1483	Wafer	1.271"
	Sleeve	1.198"
with Sleeve No. T254	Wafer	1.271"
	Sleeve	1.369"
Medium Shell Octal 8-Pin		1.337"
Large Wafer Octal 8-Pin		1.677"
with Sleeve No. T253	Wafer	1.677"
	Sleeve	1.845"
12-PIN & 14-PIN TYPES:		
Medium Shell Diheptal 14-Pin		2.200"

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

BASES

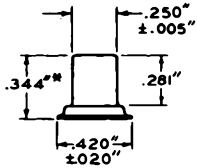
1 – TERMINAL TYPES (CAPS)

MINIATURE WITH WAFER



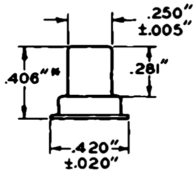
JETEC No.C1–4
RCA No.M–399

SKIRTED MINIATURE



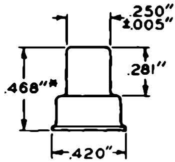
JETEC No.C1–3
RCA No.3933

SKIRTED MINIATURE



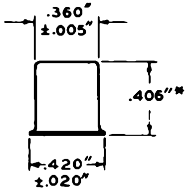
JETEC No.C1–2
RCA No.3927

SKIRTED MINIATURE



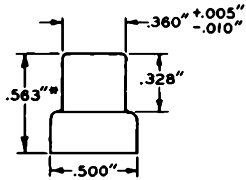
JETEC No.C1–33

SMALL



JETEC No.C1–1
RCA No.3907

SKIRTED SMALL



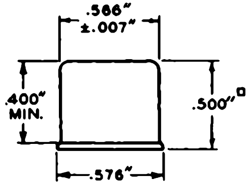
JETEC No.C1–22

* Add 0.020″ for solder on finished tube.

BASES

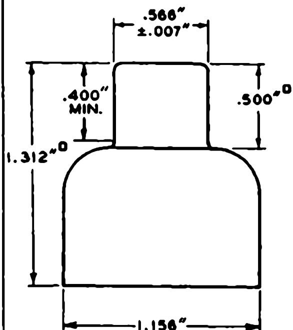
1-TERMINAL TYPES (CAPS)

MEDIUM



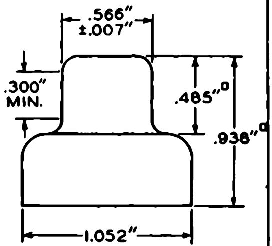
JETEC No.C1-5
RCA No.3903

SKIRTED MEDIUM



JETEC No.C1-6
RCA No.3904

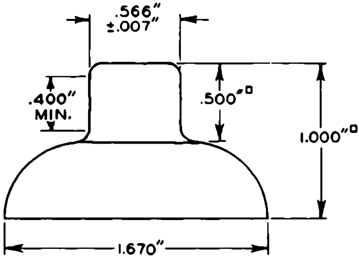
SKIRTED MEDIUM



JETEC No.C1-14
RCA No.3980

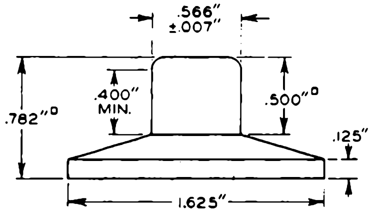
□ Add 0.040" for solder on finished tube.

SKIRTED MEDIUM



JETEC No.C1-27
RCA No.3985

SKIRTED MEDIUM



JETEC No.C1-29
RCA No.39002

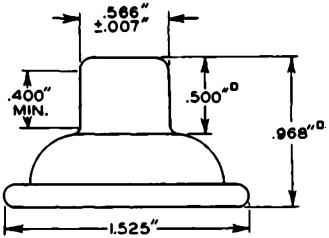
□ Add 0.040" for solder on finished tube.

RCA

BASES

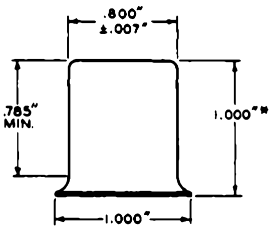
1 TERMINAL TYPES (CAPS)

SKIRTED MEDIUM
WITH ROLLED EDGE



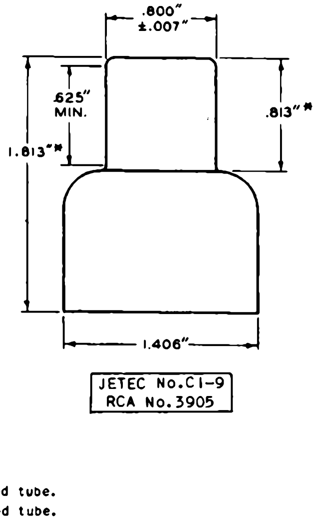
JETEC No.C1-19
RCA No.3940

LARGE



JETEC No.C1-8
RCA No.3910

SKIRTED LARGE



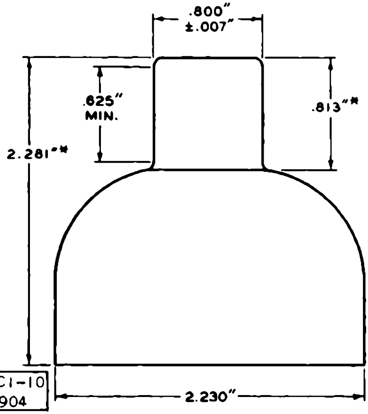
JETEC No.C1-9
RCA No.3905

° Add 0.040" for solder on finished tube.
* Add 0.060" for solder on finished tube.

BASES

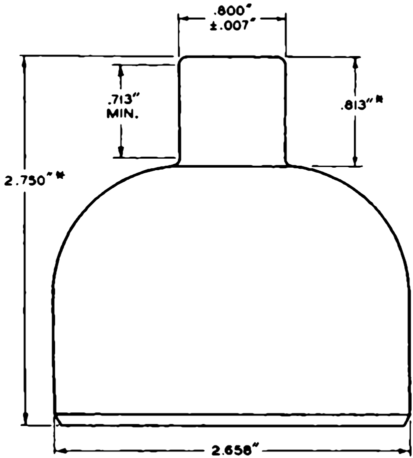
1-TERMINAL TYPES (CAPS)

SKIRTED LARGE



JETEC No.C1-10
RCA No.1904

SKIRTED LARGE

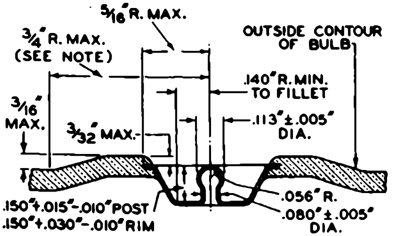


JETEC No.C1-30
RCA No.1902

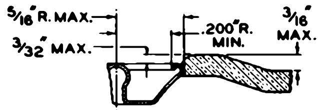
* Add 0.060" for solder on finished tube.

DETAILS OF RECESSED SMALL BALL CAP & BULB ASSEMBLY

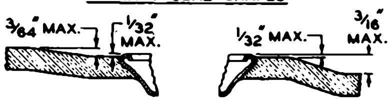
JETEC No. J1-22



ALTERNATE EDGE DESIGN



VARIANT SEAL SHAPES



NOTE: PROTRUSION OF GLASS AROUND CAP ABOVE BULB CONTOUR IS LIMITED TO AREA BOUNDED BY CIRCLE CONCENTRIC WITH CAP AXIS AND HAVING RADIUS OF 3/4" MAX.

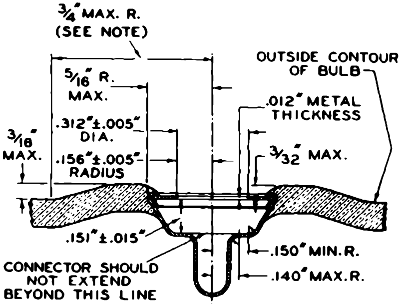
FOR ATTACHING OR DETACHING, THE CONNECTOR SHOULD REQUIRE NOT MORE THAN 8 POUNDS TOTAL FORCE PERPENDICULAR TO THE PLANE OF THE RIM OF THE CAP.

ANGLE BETWEEN PLANE OF THE RIM OF CAP AND PLANE TANGENT TO ORIGINAL CONTOUR OF BULB AT CENTER OF CAP WILL NOT BE MORE THAN 10°.

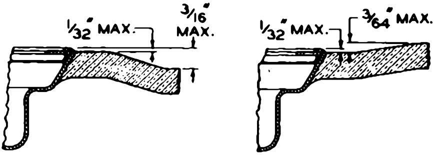
92CM-6535R4

DETAILS OF RECESSED SMALL CAVITY CAP & BULB ASSEMBLY

JETEC No. J1-21



VARIANT SEAL SHAPES



NOTE: PROTRUSION OF GLASS AROUND CAP ABOVE BULB CONTOUR IS LIMITED TO AREA BOUNDED BY CIRCLE CONCENTRIC WITH CAP AXIS AND HAVING RADIUS OF 3/4" MAX.

FOR ATTACHING OR DETACHING, THE CONNECTOR SHOULD REQUIRE NOT MORE THAN 8 POUNDS TOTAL FORCE PERPENDICULAR TO THE PLANE OF THE RIM OF THE CAP.

CONNECTOR SHOULD PROVIDE POSITIVE SPRING CONTACT TO TOP AND BOTTOM INTERIOR SURFACES. IT SHOULD NOT MAKE CONTACT TO THE INSIDE TOP SURFACE ONLY.

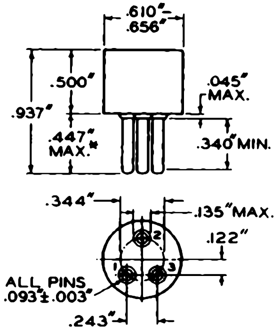
ANGLE BETWEEN PLANE OF THE RIM OF CAP AND PLANE TANGENT TO ORIGINAL CONTOUR OF BULB AT CENTER OF CAP WILL NOT BE MORE THAN 10°.

92CM-6651R2

BASES

3-PIN TYPES

SMALL-SHELL PEEWEE 3-PIN



JETEC No.A3-1
RCA No.3313

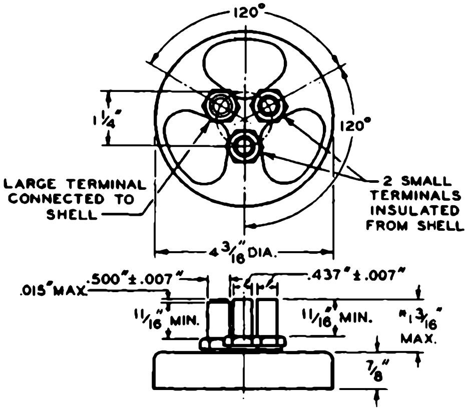
Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No.GA3-1) having thickness of 1/4" and three holes with diameters of 0.1030"– 0.1035" so located on a 0.3440" ± 0.0005" diameter circle that the distance along the chord between two adjacent hole centers is 0.2340" ± 0.0005" and the distance along the chord between the remaining pin and the two adjacent pins is 0.3175" ± 0.0005".

Pin fit in gauge is such that gauge together with supplementary weight totaling 2 pounds will not be lifted when pins are withdrawn.

* Add 0.020" for solder on finished tube.

BASES

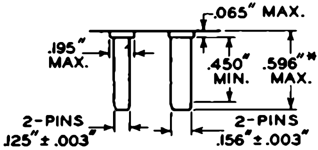
3-TERMINAL TYPES

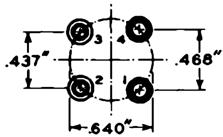


JETEC No. A3-80
RCA No. 3232

* Add 1/8" for solder on finished tube.

"SMALL 4-PIN"
PIN DIMENSIONS AND ORIENTATION

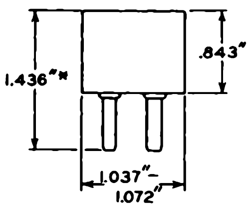




Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No.GA4-1) having thickness of 1/4" and four holes, two with diameters of 0.1650" ± 0.0005" and two with diameters of 0.1340" ± 0.0005" so located on a 0.6400" ± 0.0005" diameter circle that the distance between the adjacent 0.1650" diameter pins is 0.468" ± 0.0005" and the distance between the adjacent 0.1340" diameter pins is 0.437" ± 0.0005".

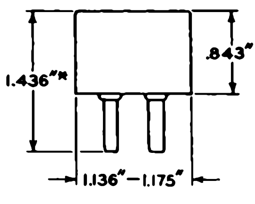
Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

DWARF-SHELL SMALL 4-PIN



JETEC No.A4-26
RCA No.4107

SMALL-SHELL SMALL 4-PIN



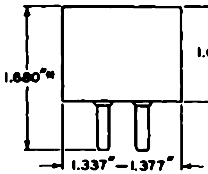
JETEC No.A4-5
RCA No.4108

* Add 0.030" for solder on finished tube.

BASES

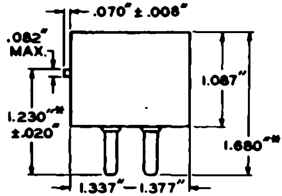
4-PIN TYPES

MEDIUM-SHELL SMALL 4-PIN



JETEC No. A4-9
RCA No. 4106

MEDIUM-SHELL SMALL 4-PIN WITH BAYONET



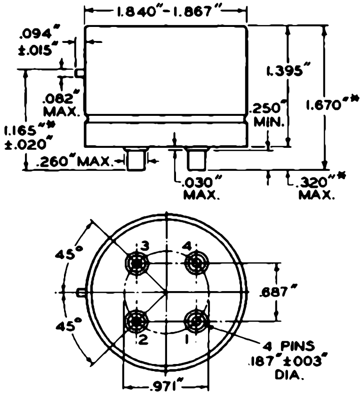
JETEC No. A4-10
RCA No. 4102

For other dimensions, see first page of the "Small 4-Pin" series.

* Add 0.030" for solder on finished tube.

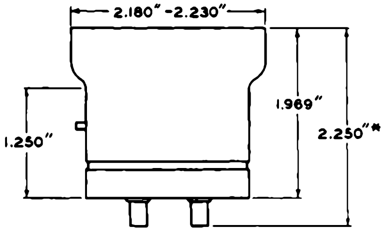
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

MEDIUM-METAL-SHELL JUMBO 4-PIN WITH BAYONET



JETEC No. A4-29
RCA No. 1839B

SKIRTED MEDIUM-METAL-SHELL JUMBO 4-PIN WITH BAYONET



JETEC No. A4-69
RCA No. 4260A

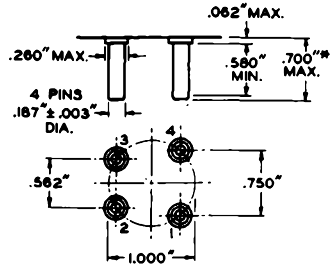
Other dimensions are same as Base JETEC No. A4-29 above.

* Add 0.060" for solder on finished tube.

BASES

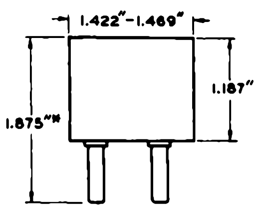
4-PIN TYPES

SUPER-JUMBO 4-PIN
PIN DIMENSIONS AND ORIENTATION



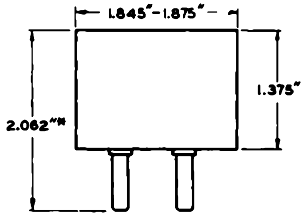
Base-pin positions are held to tolerances such that pin centers may deviate a maximum distance of 0.010" from their true geometric position.

SMALL-SHELL SUPER-JUMBO 4-PIN



JETEC No.A4-15
RCA No.411

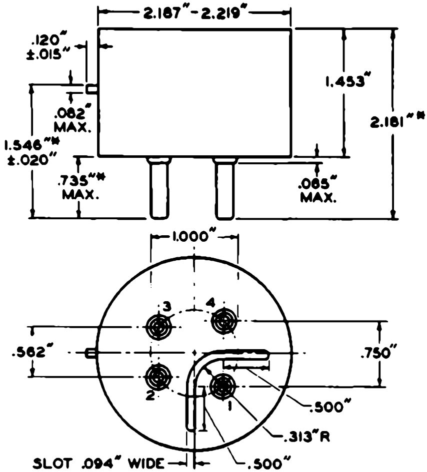
MEDIUM-SHELL SUPER-JUMBO 4-PIN



JETEC No.A4-16
RCA No.412

* Add 0.060" for solder on finished tube.

LARGE - SHELL SUPER-JUMBO 4 - PIN
WITH BAYONET

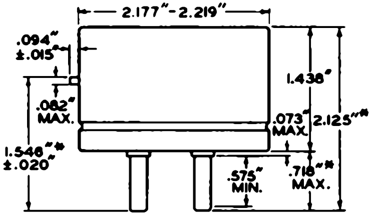


JETEC No. B4-133
RCA No. 3982

For other dimensions, see first page of the "Super-Jumbo" series.

* Add 0.060" for solder on finished tube.

LARGE-METAL-SHELL SUPER-JUMBO 4-PIN WITH BAYONET



JETEC No. A4-18
RCA No. 4310

For other dimensions, see first page of the "Super-Jumbo" series.

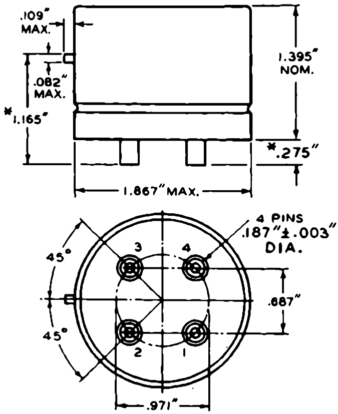
* Add 0.060" for solder on finished tube.

BASES

4-PIN TYPES

With Bottom View

JUMBO 4-PIN



No. 1839

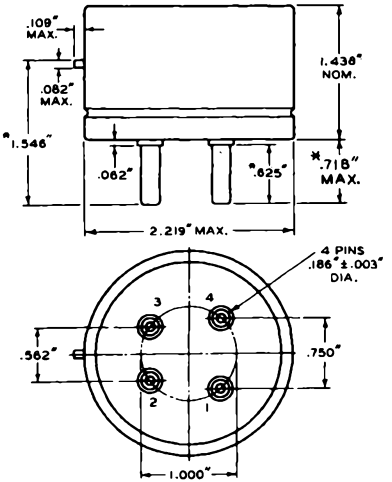
* On finished tube, add .060" for solder.

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

BASES

4-PIN TYPES
With Bottom View

SUPER-JUMBO 4-PIN

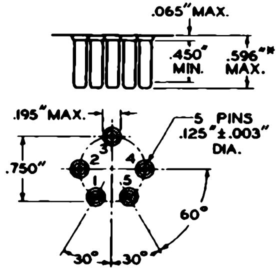


No. 4310

* On finished tube, add .030" for solder.

5-PIN TYPES

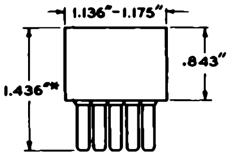
"SMALL 5-PIN"
PIN DIMENSIONS AND ORIENTATION



Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GA5-1) having thickness of 1/4" and five holes with diameters of 0.1360" ± 0.0005" so located on a 0.7500" ± 0.0005" diameter circle that the distance between centers of the four adjacent holes is 0.3750" ± 0.0005" and the distance between the center of the remaining hole and its adjacent hole centers is 0.5300" ± 0.0005".

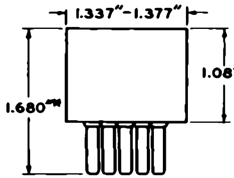
Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

SMALL-SHELL SMALL 5-PIN



JETEC No. A5-6
RCA No. 5108

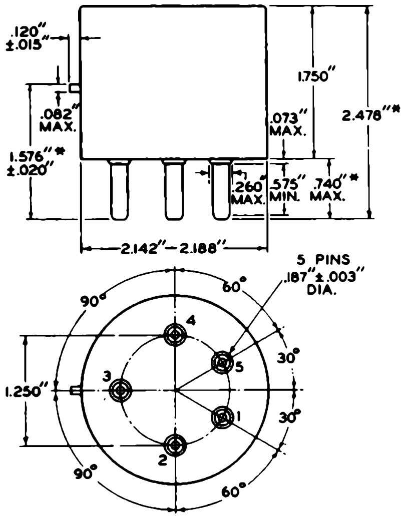
MEDIUM-SHELL SMALL 5-PIN



JETEC No. A5-11
RCA No. 5106

* Add 0.030" for solder on finished tube.

MEDIUM-SHELL GIANT 5-PIN WITH BAYONET



JETEC No.A5-19
RCA No.5325

SPECIAL METAL-SHELL GIANT 5-PIN

See Tube Types 4-125A/4D21 and 4-250A/5D22

SPECIAL METAL-SHELL SUPER-GIANT 5-PIN

See Tube Type 4-1000A

* Add 0.030" for solder on finished tube.

SMALL-SHELL DUODECAL 5-PIN

For details of this base, see corresponding DUODECAL 12-PIN type

DWARF-SHELL OCTAL 5-PIN
SMALL-SHELL OCTAL 5-PIN
SMALL-WAFER OCTAL 5-PIN
SMALL-WAFER OCTAL 5-PIN WITH SLEEVE
INTERMEDIATE-SHELL OCTAL 5-PIN
SHORT INTERMEDIATE-SHELL OCTAL 5-PIN
SHORT INTERMEDIATE-SHELL OCTAL 5-PIN WITH EXTERNAL BARRIERS
MEDIUM-SHELL OCTAL 5-PIN
SHORT JUMBO-SHELL OCTAL 5-PIN

For details of above bases, see corresponding OCTAL 8-PIN type

SMALL RADIAL 5-PIN

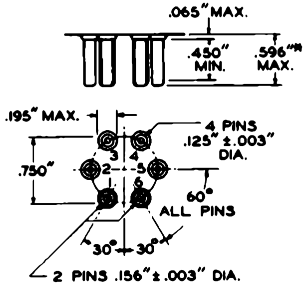
See OUTLINES--Glass Types

MEDIUM-MOLDED-FLARE SEPTAR 5-PIN

See Tube Type 4-65A

6-PIN TYPES

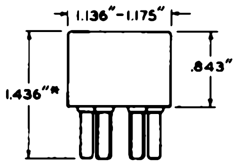
"SMALL 6-PIN"
PIN DIMENSIONS AND ORIENTATION



Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No.GA6-1) having thickness of 1/4" and six holes, two adjacent with diameters of 0.1650" ± 0.0005" and four with diameters of 0.1360" ± 0.0005" so located on a 0.7500" ± 0.0005" diameter circle that the distance between any two adjacent hole centers is 0.3750" ± 0.0005".

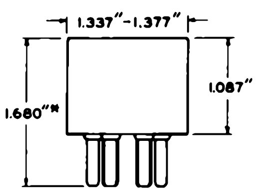
Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

SMALL-SHELL SMALL 6-PIN



JETEC No.A6-7
RCA No.6108

MEDIUM-SHELL SMALL 6-PIN



JETEC No.A6-12
RCA No.6106

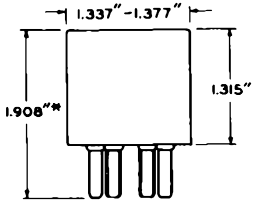
* Add 0.030" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

BASES

6-PIN TYPES

LONG MEDIUM-SHELL SMALL 6-PIN



RCA No.6105

For other dimensions, see first page of the "Small 6-Pin" series.

SMALL-SHELL DUODECAL 6-PIN

For details of this base, see corresponding DUODECAL 12-PIN type

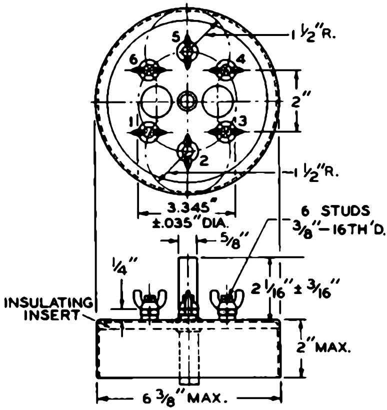
SMALL-SHELL OCTAL 6-PIN
INTERMEDIATE-SHELL OCTAL 6-PIN
SHORT INTERMEDIATE-SHELL OCTAL 6-PIN
SHORT INTERMEDIATE-SHELL OCTAL 6-PIN WITH EXTERNAL BARRIERS
MEDIUM-SHELL OCTAL 6-PIN
SHORT JUMBO-SHELL OCTAL 6-PIN
SMALL-WAFER OCTAL 6-PIN
SMALL-WAFER OCTAL 6-PIN WITH SLEEVE

For details of above bases, see corresponding OCTAL-8 PIN type

* Add 0.030" for solder on finished tube.

BASES

6-TERMINAL TYPES

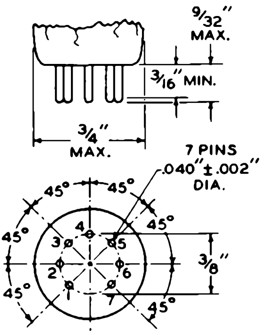


SPACE FOR CONNECTOR BETWEEN WING NUT AND LOCK NUT IS 3/16" MAX.

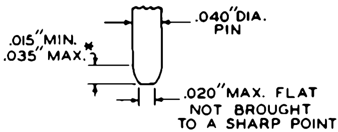
JETEC No. FO-6
RCA No. 6628

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SMALL-BUTTON MINIATURE 7-PIN



Miniature Base Pin Contour



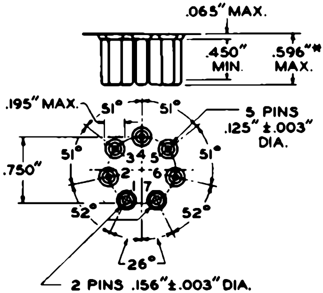
JETEC No. E7-1

Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from flat-plate gauge (part of gauge JETEC No. GE7-1) having thickness of 1/4" and eight holes with diameters of 0.0520" ± 0.0005" so located on a 0.3750" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.1434" ± 0.0005".

The design of the socket should be such that circuit wiring can not impress lateral strains through the socket contacts on the base pins. The point of bearing of the contacts on the base pins should not be closer than 1/8" from the bottom of the seated tube.

* This dimension around the periphery of any individual pin may vary within the limits shown.

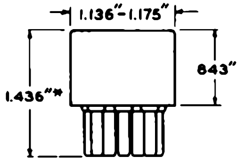
"SMALL 7-PIN"
PIN DIMENSIONS AND ORIENTATION



Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No.GA7-1) having thickness of 1/4" and seven holes, two adjacent with diameters of 0.1650" ± 0.0005" and five with diameters of 0.1360" ± 0.0005" so located on a 0.7500" ± 0.0005" diameter circle that the distance between centers of the adjacent 0.1650" diameter holes is 0.3288" ± 0.0005" and the distance between centers of the adjacent 0.1360" diameter holes is 0.3229" ± 0.0005".

Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

SMALL-SHELL SMALL 7-PIN



JETEC No.A7-8
RCA No.7108

* Add 0.030" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

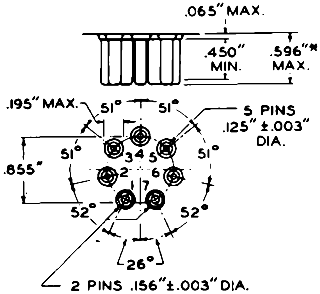
RCA

BASES

7-PIN TYPES

"MEDIUM 7-PIN"

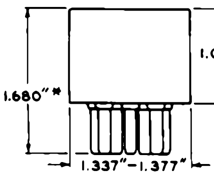
PIN DIMENSIONS AND ORIENTATION



Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No.GA7-2) having thickness of 1/4" and seven holes, two adjacent with diameters of 0.1650" ± 0.0005" and five with diameters of 0.1360" ± 0.0005" so located on a 0.8550" ± 0.0005" diameter circle that the distance between centers of the adjacent 0.1650" diameter holes is 0.3748" ± 0.0005" and the distance between centers of the adjacent 0.1360" diameter holes is 0.3681" ± 0.0005".

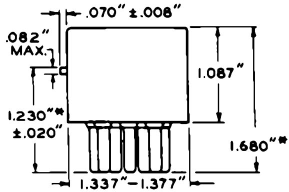
Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

MEDIUM-SHELL MEDIUM 7-PIN



JETEC No.A7-13
RCA No.7306

MEDIUM-SHELL MEDIUM 7-PIN WITH BAYONET

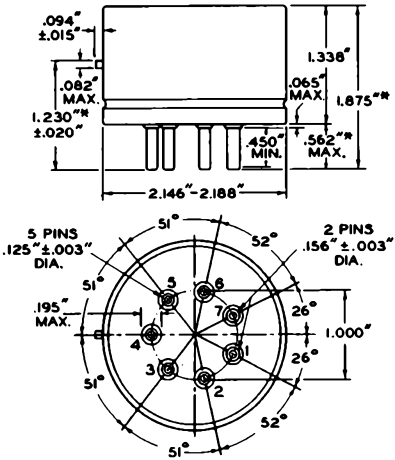


JETEC No.A7-14
RCA No.7302

* Add 0.030" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

MEDIUM-METAL-SHELL GIANT 7-PIN WITH BAYONET



JETEC No. A7-17
RCA No. 7609

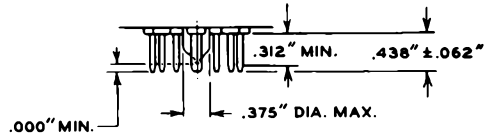
VENTILATED MEDIUM-METAL-SHELL GIANT 7-PIN

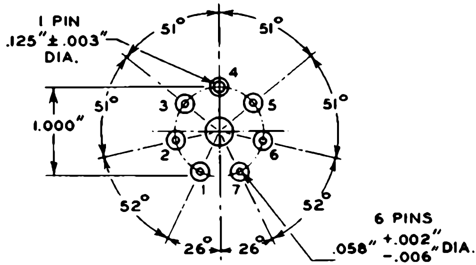
See Tube Type 4E27A/5-125B

* Add 0.060" for solder on finished tube.

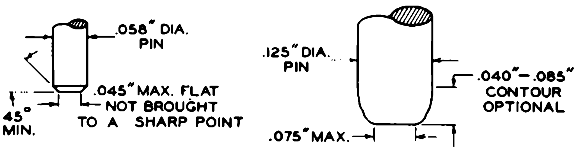
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

"SEPTAR 7-PIN"
PIN DIMENSIONS AND ORIENTATION





Septar Base Pin Contour



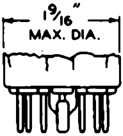
Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from flat-plate gauge having thickness of 3/8" and seven holes, one with diameter of 0.1450" ± 0.0005" and six with diameters of 0.0800" ± 0.0005" located on a 1.0000" ± 0.0005" diameter circle at specified angles with a tolerance of ±5' for each angle. Gauge is also provided with a hole 0.500" ± 0.010" concentric with pin circle.

It is essential that the socket shall be constructed with floating-contact clips.

BASES

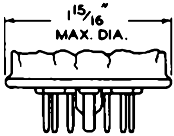
7-PIN TYPES

SMALL-BUTTON SEPTAR 7-PIN



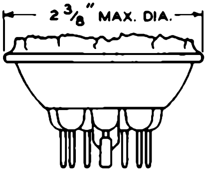
JETEC No. E7-26
RCA No. FSB710

SMALL-WAFER SEPTAR 7-PIN



JETEC No. E7-21
RCA No. FSB712

MEDIUM MOLDED-FLARE SEPTAR 7-PIN



JETEC No. E7-2
RCA No. FSB603

For other dimensions of above bases, see first page of the "Septar 7-Pin" series

BASES

7-PIN TYPES

SMALL-SHELL DUODECAL 7-PIN

For details of this base, see corresponding DUODECAL 12-PIN type

SMALL-SHELL OCTAL 7-PIN

INTERMEDIATE-SHELL OCTAL 7-PIN

SHORT INTERMEDIATE-SHELL OCTAL 7-PIN WITH EXTERNAL BARRIERS

MEDIUM-SHELL OCTAL 7-PIN

SHORT JUMBO-SHELL OCTAL 7-PIN

SMALL-WAFER OCTAL 7-PIN

SMALL-WAFER OCTAL 7-PIN WITH SLEEVE

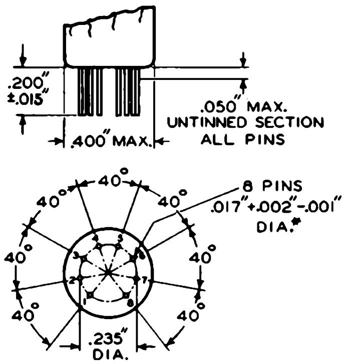
For details of above bases, see corresponding OCTAL 8-PIN type

SMALL RADIAL 7-PIN

See OUTLINES--Glass Tubes

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SMALL-BUTTON SUB-MINAR 8-PIN



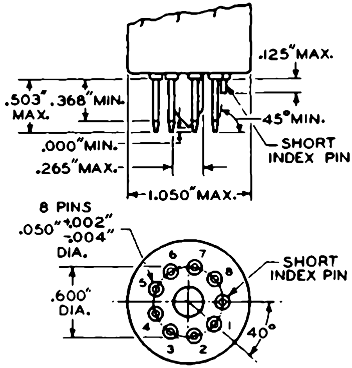
JETEC No.E8-9

Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from flat-plate gauge (part of gauge JETEC No.GE8-1) having thickness of 13/64" and nine holes with diameters of 0.0240" ± 0.0005" so located on a 0.2350" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.0804" ± 0.0005".

The design of the socket should be such that the point of bearing of the contacts on the base pins should not be closer that 0.050" from the bottom of the seated tube.

* The specified pin diameter applies only in the zone between 0.050" from the base seat and the end of the pin.

SMALL-BUTTON DITETRAR 8-PIN



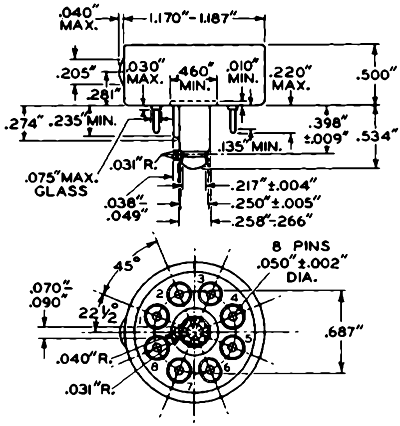
JETEC No. E8-11
RCA No. FS8675

Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from flat-plate gauge having thickness of 1/4" and nine holes with diameters of 0.0700" ± 0.0005" so located on a 0.6000" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.2052" ± 0.0005". Gauge is also provided with a hole having diameter of 0.300" ± 0.001" concentric with the pin circle.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

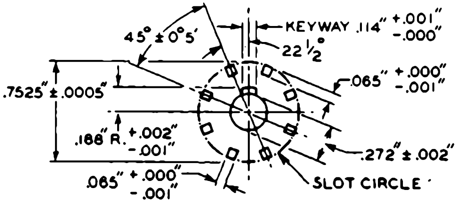
8-PIN TYPES

LOCK-IN 8-PIN

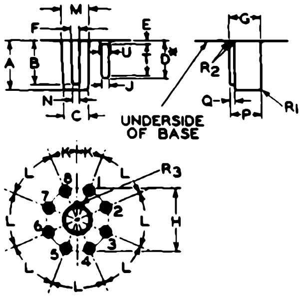


JETEC No. D8-1

Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from gauge JETEC No. GD8-1. This gauge contains a flat-plate section having thickness of 1/4" and eight slots located and dimensioned as shown on the following diagram. Flat-plate section is also provided with a hole having diameter of 0.272" ± 0.002" concentric with slot circle, and with a keyway as shown on the diagram.



"OCTAL"
PIN DIMENSIONS AND ORIENTATION AND INDEX GUIDE



	Min.	Center	Max.		Min.	Center	Max.
A	.550"	.560"	.570"	L	-	45°	-
B	.490"	.500"	.510"	M	.305"	.312"	.317"
C	.300"	.308"	.315"	N	.075"	.080"	.085"
D	.427"	.437"	.447"	P	.343"	.353"	.363"
E	-	-	.050"	Q	.040"	.047"	.055"
F	.085"	.090"	.095"	R_1	-	.031"	-
G	.352"	.362"	.372"	R_2	-	-	.050"
H	-	.687"	-	R_3	-	.040"	-
J	.090"	.093"	.096"	T	.340"	-	-
K	-	22.5°	-	U	-	-	.135"

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No.GB8-1) having thickness of 1/4" and eight holes with diameters of 0.1030" ± 0.0005" so located on a 0.6870" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.2629" ± 0.0005".

Pin fit in gauge is such that gauge together with supplementary weight totaling 2 pounds will not be lifted when pins are withdrawn.

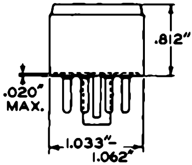
* Add 0.030" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

BASES

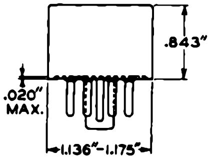
8-PIN TYPES

DWARF-SHELL OCTAL



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
5-Pin	1, 3, 5, 7,8	B5-45	-

SMALL-SHELL OCTAL

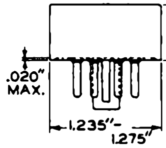


No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	B8-1	8529
7-Pin	1,2,3,4,5, 7,8	B7-2	7529
6-Pin	1,2,3, 5, 7,8	B6-3	6529
5-Pin	1,2, 4, 6, 8	B5-5	5529

For other dimensions of above bases, see first page of the "Octal" series

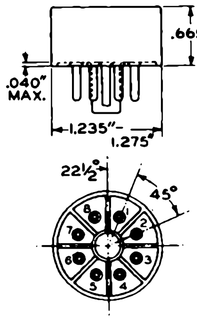
8-PIN TYPES

SHORT INTERMEDIATE-SHELL OCTAL



No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	B8-46	8555
7-Pin	1,2,3,4,5, 7,8	B7-47	7555
6-Pin	1,2,3, 5, 7,8	B6-48	6555
5-Pin	1,2, 4, 6, 8	B5-49	5555

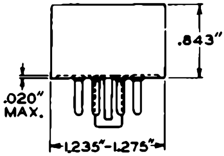
SHORT INTERMEDIATE-SHELL OCTAL WITH EXTERNAL BARRIERS



No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	B8-58	8565
7-Pin	1,2,3,4,5, 7,8	B7-59	7565
6-Pin	1,2,3, 5, 7,8	B6-60	6565
5-Pin	1,2, 4, 6, 8	B5-62	5565

For other dimensions of above bases, see first page of the "Octal" series

INTERMEDIATE-SHELL OCTAL



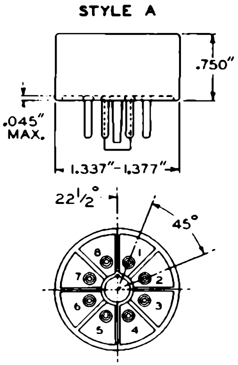
No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	B8-6	8537
7-Pin	1,2,3,4,5, 7,8	B7-7	7537
6-Pin	1,2,3, 5, 7,8	B6-8	6537
6-Pin	2,3,4,5, 7,8	B6-81	-
5-Pin	1,2, 4, 6, 8	B5-10	5537
5-Pin	2,3, 5, 7,8	B5-82	-

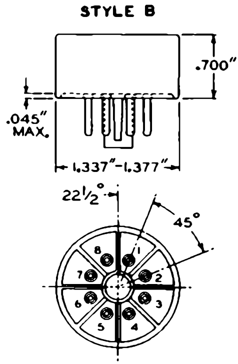
For other dimensions, see first page of the "Octal" series

BASES

8-PIN TYPES

SHORT MEDIUM-SHELL OCTAL
WITH EXTERNAL BARRIERS





No. of Pins	*Pins*	*Style*	*JETEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	A	B8-110	-
8-Pin	1,2,3,4,5,6,7,8	B	B8-118	8564
7-Pin	1,2,3,4,5, 7,8	A	B7-111	-
7-Pin	1,2,3,4,5, 7,8	B	B7-119	7564
6-Pin	1,2,3, 5, 7,8	A	B6-112	-
6-Pin	1,2,3, 5, 7,8	B	B6-120	6564
6-Pin	2,3,4,5, 7,8	A	B6-148	-
6-Pin	2,3,4,5, 7,8	B	B6-122	6764
5-Pin	1,2, 4, 6, 8	A	B5-113	-
5-Pin	1,2, 4, 6, 8	B	B5-121	5564
5-Pin	2,3, 5, 7,8	A	B5-149	-
5-Pin	2,3, 5, 7,8	B	B5-123	5764

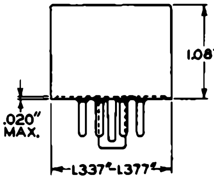
For other dimensions, see first page of the "Octal" series

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

BASES

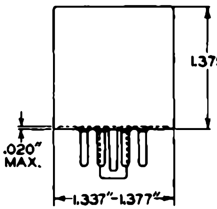
8-PIN TYPES

MEDIUM-SHELL OCTAL



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	B8-11	8533
7-Pin	1,2,3,4,5, 7,8	B7-12	7533
6-Pin	1,2,3, 5, 7,8	B6-13	6533
5-Pin	1,2, 4, 6, 8	B5-15	5533

LONG MEDIUM-SHELL OCTAL

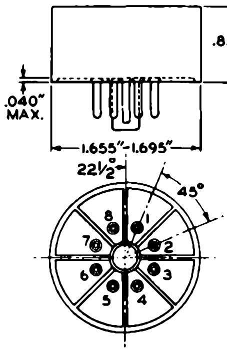


No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	B8-65	8545
5-Pin	2,3, 5, 7,8	B5-80	5545

For other dimensions of above bases, see first page of the "Octal" series

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SHORT JUMBO-SHELL OCTAL
WITH EXTERNAL BARRIERS



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	B8-71	8556
7-Pin	1,2,3,4,5, 7,8	B7-72	7556
6-Pin	1,2,3, 5, 7,8	B6-73	6556
5-Pin	1,2, 4, 6, 8	B5-74	5556

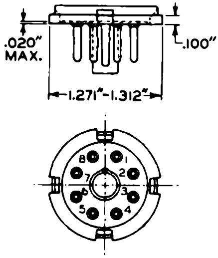
For other dimensions, see first page of the "Octal" series

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

BASES

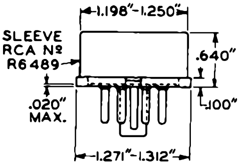
8-PIN TYPES

SMALL-WAFER OCTAL



No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	B8-21	8527
7-Pin	1,2,3,4,5, 7,8	B7-22	7527
6-Pin	1,2,3, 5, 7,8	B6-23	6527
5-Pin	1,2, 4, 6, 8	B5-25	5527

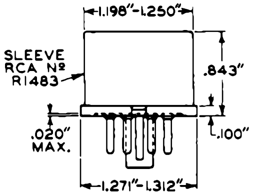
SMALL-WAFER OCTAL
WITH SHORT SLEEVE



No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	B8-44	-

For other dimensions of above bases, see first page of the "Octal" series

SMALL-WAFER OCTAL
WITH SLEEVE



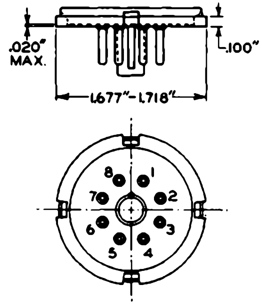
No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	B8-26	-
7-Pin	1,2,3,4,5, 7,8	B7-27	-
6-Pin	1,2,3, 5, 7,8	B6-28	-
5-Pin	1,2, 4, 6, 8	B5-30	-

For other dimensions, see first page of the "Octal" series

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

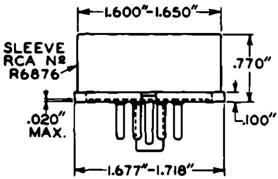
8-PIN TYPES

LARGE-WAFER OCTAL



No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	B8-32	8534

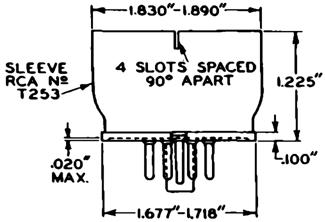
LARGE-WAFER OCTAL WITH SLEEVE



No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	B8-86	-

For other dimensions of above bases, see first page of the "Octal" series

LARGE-WAFER OCTAL
WITH FLARED SLEEVE

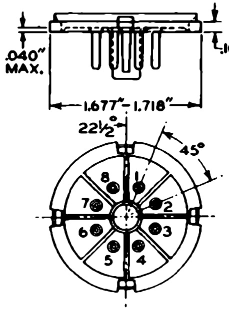


No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	-	-

For other dimensions, see first page of the "Octal" series

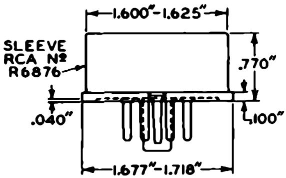
8-PIN TYPES

LARGE-WAFER OCTAL
WITH EXTERNAL BARRIERS



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	B8-94	8554

LARGE-WAFER OCTAL
WITH EXTERNAL BARRIERS AND SLEEVE

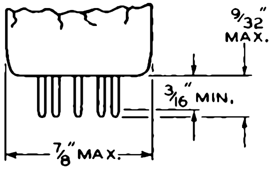


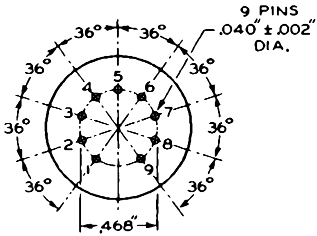
No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	B8-98	-

For other dimensions of above bases, see first page of the "Octal" series

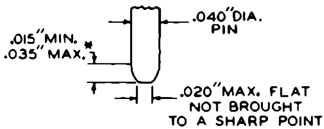
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SMALL-BUTTON NOVAL 9-PIN





Noval Base Pin Contour



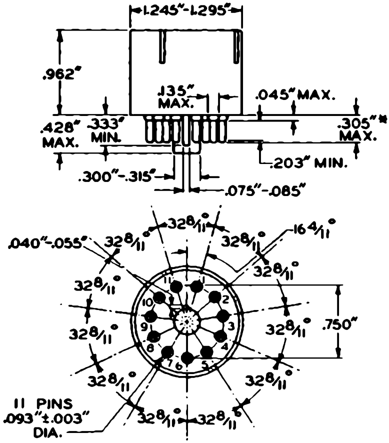
JETEC No. E9-1

Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from gauge JETEC No. GE9-1. This gauge contains a flat-plate section having thickness of 1/4" and ten holes with diameters of 0.0520" ± 0.0005" so located on a 0.4680" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.1446" ± 0.0005".

The design of the socket should be such that circuit wiring can not impress lateral strains through the socket contacts on the base pins. The point of bearing of the contacts on the base pins should not be closer than 1/8" from the bottom of the seated tube.

* This dimension around the periphery of any individual pin may vary within the limits shown.

SMALL-SHELL NEOSUBMAGNAL 11-PIN



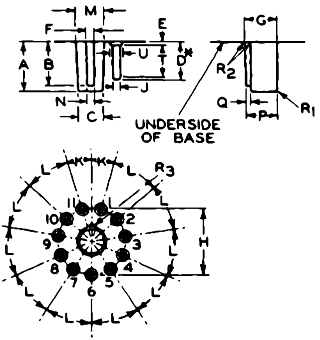
JETEC No. B11-104
RCA No. 11442

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge having thickness of 1/4" and eleven holes with diameters of 0.1030" ± 0.0005" so located on a 0.7500" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.2113" ± 0.0005".

Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

* Add 0.030" for solder on finished tube.

"SUBMAGNAL"
PIN DIMENSIONS AND ORIENTATION AND INDEX GUIDE



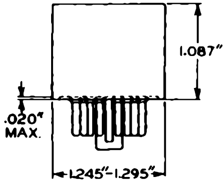
	Min.	Center	Max.		Min.	Center	Max.
A	.550"	.560"	.570"	L	-	32-8/11°	-
B	.490"	.500"	.510"	M	.305"	.312"	.317"
C	.300"	.308"	.315"	N	.075"	.080"	.085"
D	.427"	.437"	.447"	P	.343"	.353"	.363"
E	-	-	.050"	Q	.040"	.047"	.055"
F	.085"	.090"	.095"	R_1	-	.031"	-
G	.352"	.362"	.372"	R_2	-	-	.050"
H	-	.750"	-	R_3	-	.040"	-
J	.090"	.093"	.096"	T	.340"	-	-
K	-	16-4/11°	-	U	-	-	.135"

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No.GB11-2) having thickness of 1/4" and eleven holes with diameters of 0.1030" ± 0.0005" so located on a 0.7500" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.2113" ± 0.0005".

Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

* Add 0.030" for solder on finished tube.

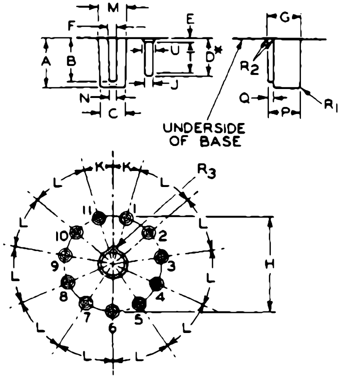
SMALL-SHELL SUBMAGNAL



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
11-Pin	1,2,3,4,5,6,7,8,9,10,11	B11-88	11344

For other dimensions, see first page of the "Submagnal" series

"MAGNAL"
PIN DIMENSIONS AND ORIENTATION AND INDEX GUIDE



	Min.	Center	Max.		Min.	Center	Max.
A	.550"	.560"	.570"	L	-	32-8/11°	-
B	.490"	.500"	.510"	M	.305"	.312"	.317"
C	.300"	.308"	.315"	N	.075"	.080"	.085"
D	.427"	.437"	.447"	P	.343"	.353"	.363"
E	-	-	.050"	Q	.040"	.047"	.055"
F	.085"	.090"	.095"	R_1	-	.031"	-
G	.352"	.362"	.372"	R_2	-	-	.050"
H	-	1.063"	-	R_3	-	.040"	-
J	.090"	.093"	.096"	T	.340"	-	-
K	-	16-4/11°	-	U	-	-	.135"

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GB11-1) having thickness of 1/4" and eleven holes with diameters of 0.1030" ± 0.0005" so located on a 1.0630" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.2995" ± 0.0005".

Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

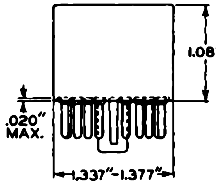
* Add 0.030" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

BASES

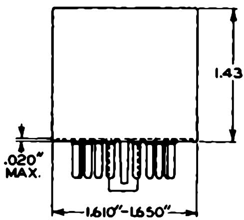
11-PIN TYPES

SMALL-SHELL MAGNAL



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
11-Pin	1,2,3,4,5,6,7,8,9,10,11	B11-33	11247

MEDIUM-SHELL MAGNAL



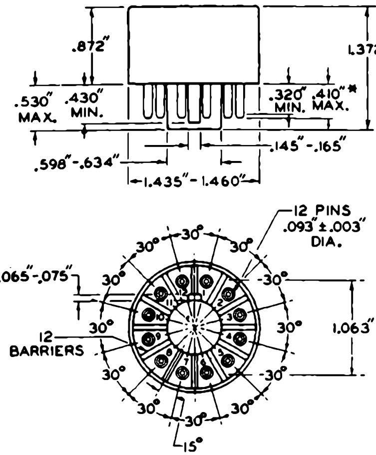
No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
11-Pin	1,2,3,4,5,6,7,8,9,10,11	B11-66	11248

For other dimensions of above bases, see first page of the "Magnal" series

BASES

12-PIN TYPES

DWARF-SHELL DUODECAL



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
12-Pin	1,2,3,4,5,6,7,8,9,10,11,12	B12-157	-
6-Pin	1,2,3, 10,11,12	B6-158	6353

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No.GB12-1) having thickness of 1/4" and twelve holes with diameters of 0.1030" ± 0.0005" so located on a 1.0630" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.2751" ± 0.0005".

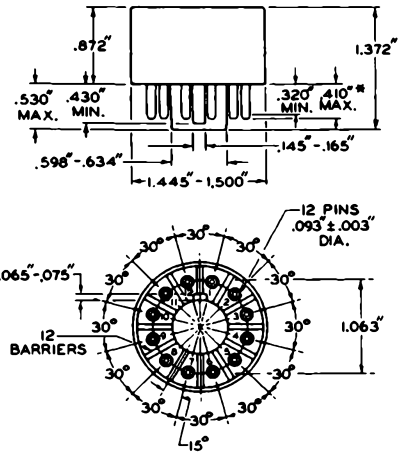
Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

* Add 0.030" for solder on finished tube.

BASES

12-PIN TYPES

SMALL-SHELL DUODECAL



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
12-Pin	1,2,3,4,5,6,7,8,9,10,11,12	B12-43	12253
10-Pin	1,2,3,4, 6,7,8,9,10, 12	B10-75	10253
7-Pin	1,2, 6,7, 10,11,12	B7-51	7253
6-Pin	1,2, 6, 10,11,12	B6-63	6253
5-Pin	1,2, 10,11,12	B5-57	5253

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GB12-1) having thickness of 1/4" and twelve holes with diameters of 0.1030" ± 0.0005" so located on a 1.0630" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.2751" ± 0.0005".

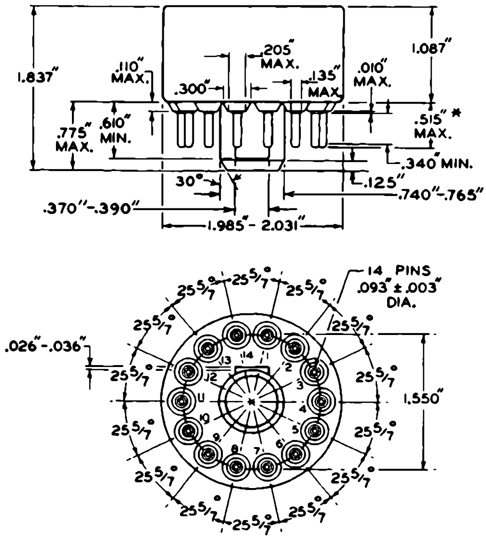
Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

* Add 0.030" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

14-PIN TYPES

SMALL-SHELL NEODIHEPTAL



No. of Pins	Pins	JETEC No.	RCA No.
14-Pin	1,2,3,4,5,6,7,8,9,10,11,12,13,14	B14-130	14560
12-Pin	1,2,3,4,5,6,7, 9, 11,12,13,14	B12-131	12560

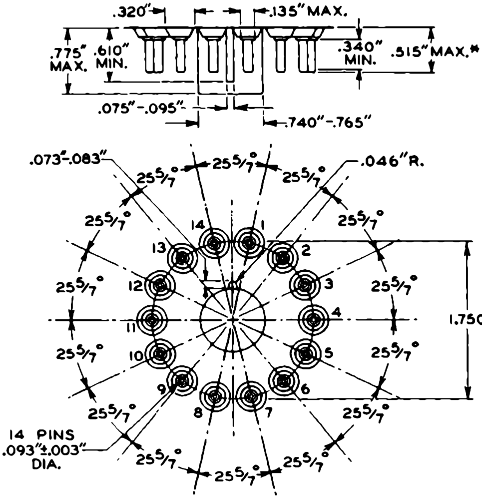
Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No.GB14-2) having thickness of 1/4" and fourteen holes with diameters of 0.1030" ± 0.0005" so located on a 1.5500" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.3449" ± 0.0005".

Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

* Add 0.030" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

"DIHEPTAL"
PIN DIMENSIONS AND ORIENTATION AND INDEX GUIDE

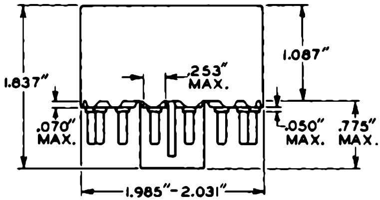


Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GB14-1) having thickness of 1/4" and fourteen holes with diameters of 0.1030" ± 0.0005" so located on a 1.750" ± 0.0005" diameter circle that the distance along the chord between any two hole centers is 0.3895" ± 0.0005".

Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

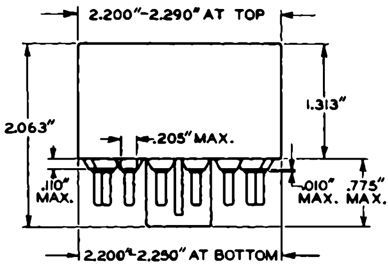
* Add 0.030" for solder on finished tube.

SMALL-SHELL DIHEPTAL



No. of Pins	Pins	JETEC No.	RCA No.
14-Pin	1,2,3,4,5,6,7,8,9,10,11,12,13,14	B14-45	14151
12-Pin	1,2,3,4,5,6,7, 9, 11,12,13,14	B12-105	12151

MEDIUM-SHELL DIHEPTAL

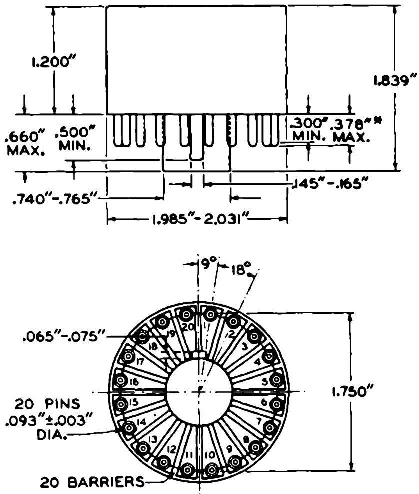


No. of Pins	Pins	JETEC No.	RCA No.
14-Pin	1,2,3,4,5,6,7,8,9,10,11,12,13,14	B14-38	14146
12-Pin	1,2,3,4,5, 7,8,9,10,11,12, 14	B12-37	12146

For other dimensions of above bases, see first page of the "Diheptal" series

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SMALL-SHELL BIDECAL



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
20-Pin	1 through 20	B20-102	20158

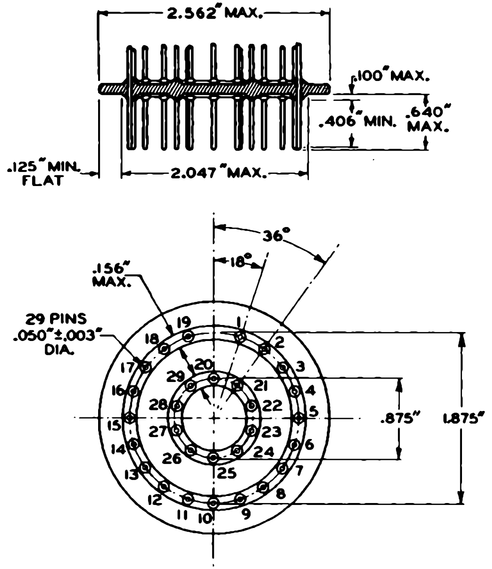
Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No.GB20-1) having thickness of 1/4" and twenty holes with diameters of 0.1030" ± 0.0005" so located on a 1.7500" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.2738" ± 0.0005".

Pin fit in gauge is such that gauge together with supplementary weight totaling 3 pounds will not be lifted when pins are withdrawn.

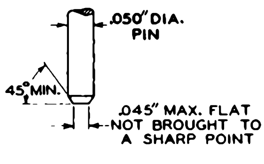
* Add 0.030" for solder on finished tube.

29-PIN TYPES

SMALL-BUTTON TWENTYNINAR



Twentyninar Base Pin Contour



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
29-Pin	1 through 29	E29-17	-
22-Pin	1 through 19,21,25,28	E22-16	FSB693
8-Pin	2,6,10,14,18,21,25,28	E8-19	FSB693A

SMALL-BUTTON TWENTYNINAR (CONT'D)

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge having thickness of 3/8" and twenty-nine holes with diameters of 0.0700" ± 0.0005", nineteen of which are located with hole centers corresponding to the specified location of pin centers on a 1.8750" ± 0.0005" diameter circle, and ten of which are located with hole centers corresponding to the specified location of pin centers on a 0.8750" ± 0.0005" diameter circle concentric with the 1.8750" circle.

Pin fit in gauge is such that entire length of pins will, without undue force, enter into and disengage from the gauge.

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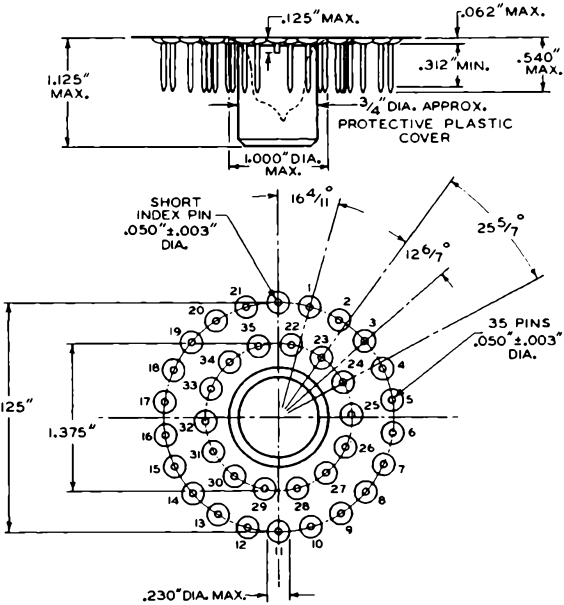
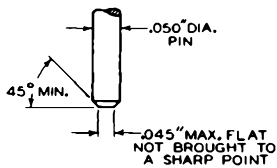
"THIRTYFIVAR"
PIN DIMENSIONS AND ORIENTATION



Thirtyfivar Base Pin Contour



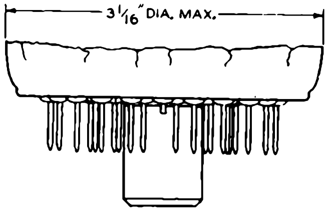
Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge having thickness of 3/8" and thirty-six holes with diameters of 0.0700" ± 0.0005", twenty-two of which are located with hole centers corresponding to the specified location of

THIRTYFIVAR (CONT'D)

pin centers on a 2.1250" ± 0.0005" diameter circle, and fourteen of which are located with hole centers corresponding to the specified location of pin centers on a 1.3750" ± 0.0005" diameter circle concentric with the 2.1250" circle.

Pin fit in gauge is such that entire length of pins will, without undue force, enter into and disengage from the gauge. Gauge is also provided with a hole 1.000" diameter minimum concentric with pin circles.

SMALL-BUTTON THIRTYFIVAR



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
35-Pin	1 through 35	E35-28	-
33-Pin	Omit pins 24 and 30	E33-29	-
31-Pin	Omit pins 24 and 30; pins 23 and 31 are trimmed to same dimension as index pin.	E31-36	-

For other dimensions of above base, see first page of the "Thirtyfivar" series

DEFINITIONS ■

Amplification Factor (μ) is a special case of mu-factor. It is the ratio of the change in plate voltage to a change in control-electrode voltage under the conditions that the plate current remains unchanged and that all other electrode voltages are maintained constant. It is a measure of the effectiveness of the control-electrode voltage relative to that of the plate voltage upon the plate current. The sense is usually taken as positive when the voltages are changed in opposite directions. As most precisely used, the term amplification factor refers to infinitesimal changes. 1E62

Class A Amplifier: • An amplifier in which the grid bias and the alternating grid voltages are such that plate current in a specific tube flows at all times. 1E69

The ideal class A amplifier is one in which the alternating component of the plate current is an exact reproduction of the form of the alternating grid voltage, and the plate current flows during the 360 electrical degrees of the cycle. The characteristics of a class A amplifier are low efficiency and output.

Class AB Amplifier: • An amplifier in which the grid bias and alternating grid voltages are such that plate current in a specific tube flows for appreciably more than half but less than the entire electrical cycle. 1E70

The characteristics of a class AB amplifier are efficiency and output intermediate to those of a class A and a class B amplifier. The idle plate current and attendant dissipation may be made substantially less than is possible with class A amplifiers. This amplifier has been called class A prime.

■ Definitions taken from the 1933 Report of the Standards Committee of the I.R.E. are followed by the definition number in the report.

• To denote that grid current does not flow during any part of the input cycle, the suffix 1 may be added to the letter or letters of the class identification. The suffix 2 may be used to denote that grid current flows during some part of the cycle.

DEFINITIONS

(continued from preceding page)

Class B Amplifier:* An amplifier in which the grid bias is approximately equal to the cutoff value so that the plate current is approximately zero when no exciting grid voltage is applied and so that plate current in a specific tube flows for approximately one half of each cycle when an alternating grid voltage is applied. 1E71

The ideal class B amplifier is one in which the alternating component of plate current is an exact replica of the alternating grid voltage for the half cycle when the grid is positive with respect to the bias voltage, and the plate current flows during 180 electrical degrees of the cycle. The characteristics of a class B amplifier are medium efficiency and output.

Class C Amplifier:* An amplifier in which the grid bias is appreciably greater than the cutoff value so that the plate current in each tube is zero when no alternating grid voltage is applied, and so that plate current in a specific tube flows for appreciably less than one half of each cycle when an alternating grid voltage is applied. 1E72

Class C amplifiers find application where high plate-circuit efficiency is a paramount requirement and where departure from linearity between input and output is permissible. The characteristics of a class C amplifier are high plate-circuit efficiency and high power output.

Control-Grid—Plate Transconductance (g_m) is the name for the plate-current-to-control-grid-voltage transconductance. This is ordinarily the most important transconductance and is commonly understood when the term "transconductance" is used. 1E56

Formerly it was known as mutual conductance. See definition of Transconductance.

Conversion Transconductance (g_c) is the quotient

* See preceding page.

DEFINITIONS

(continued from preceding page)

of the magnitude of a single beat-frequency component $(f_1 + f_2)$ or $(f_1 - f_2)$ of the output-electrode current by the magnitude of the control-electrode voltage of frequency f_1, under the conditions that all direct electrode voltages and the magnitude of the electrode alternating voltage f_2 remain constant and that no impedances at the frequencies f_1 or f_2 are present in the output circuit. As most precisely used, the term refers to infinitesimal changes. 1E60

When the performance of a frequency converter is determined, conversion transconductance is used in the same way as transconductance is used in single-frequency amplifier computations.

Deflection Factor of a cathode-ray oscillograph tube is the reciprocal of the deflection sensitivity. 3E11

Deflection Sensitivity of a cathode-ray oscillograph tube is the quotient of the displacement of the electron beam at the place of impact by the change in the deflecting field. It is usually expressed in millimeters per volt applied between the deflecting electrodes or in millimeters per gauss of the deflecting magnetic field. 3E10

Direct Capacitance between two electrodes in a multielectrode tube is the ratio of the charge placed on either electrode to its resulting change in potential above the other electrode when all remaining (n-2) electrodes are at the potential of the first electrode, the charge placed on the second electrode being equal to the sum of the charges placed on all the other electrodes.

Electrode Current is the current passing to or from an electrode through the vacuous space. 1E39

The terms grid current, anode current, plate current, etc., are used to designate currents passing to or from these specific electrodes.

Electrode Dissipation is the power dissipated in the

DEFINITIONS

(continued from preceding page)

form of heat by an electrode as a result of electron and/or ion bombardment. 1E46

Electrode Voltage is the voltage between an electrode and a specified point of the cathode. 1E40

The terms grid voltage, anode voltage, plate voltage, etc., are used to designate the voltage between these specific electrodes and the cathode.

Gas Amplification Factor of a phototube is the factor of increase in the sensitivity of a gas phototube due solely to the ionization of the contained gas. For a gas phototube having a structure such as to permit saturation to occur at a voltage (approximately 25 volts) less than that causing appreciable ionization, the gas amplification factor at a specified operating voltage is the ratio of the sensitivity measured at that voltage to the sensitivity measured at the saturation voltage. 4E5

Grid Driving Power is the average product of the instantaneous value of the grid current and of the alternating component of the grid voltage over a complete cycle. This comprises the power supplied to the biasing device and to the grid. 1E42

Input Capacitance of a vacuum tube is the sum of the direct capacitances between the control grid and the cathode and such other electrodes as are operated at the alternating potential of the cathode. This is not the effective input capacitance, which is a function of the impedances of the associated circuits. 1E67

Modulation Factor in an amplitude-modulated wave is the ratio of half the difference between the maximum and minimum amplitudes to the average amplitude.

In linear modulation the average amplitude of the envelope is equal to the amplitude of the unmodulated wave, provided there is no zero-frequency component in the modulating signal wave (as in telephony). For modulating signal waves having unequal positive and negative peaks, positive and negative modulation factors may be defined as the ratios of the maximum departures (positive and negative) of the envelope from its average value to its average value. (See Percentage Modulation.) 1T-39

Mu-Factor (μ-factor) is the ratio of the change in one electrode voltage to the change in another electrode voltage, under the conditions that a specified current remains unchanged and that all other electrode voltages are maintained constant. It is a measure of the relative effect of the voltages on two electrodes upon the current in the circuit of any specified electrode. As most precisely used, the term μ-factor refers to infinitesimal changes. 1E61

Output Capacitance of a vacuum tube is the sum of the direct capacitances between the output electrode (usually the plate) and the cathode and such other electrodes as are operated at the alternating potential of the cathode. This is not the effective output capacitance, which is a function of the impedances of the associated circuits. 1E68

Peak Forward Plate Voltage is the maximum instantaneous plate voltage in the direction in which the tube is designed to pass current. 1E43

Peak Inverse Plate Voltage is the maximum instantaneous plate voltage in the direction opposite to that in which the tube is designed to pass current. 1E44

Peak Plate Current is the maximum instantaneous plate current passing recurrently through the tube in the direction of normal current flow.

Percentage Modulation is the modulation factor expressed in per cent. 1T-40

Plate Resistance is the quotient of the alternating

DEFINITIONS

(continued from preceding page)

plate voltage by the in-phase component of the alternating plate current, all other electrode voltages being maintained constant. This is the effective parallel resistance and is not the real component of the electrode impedance. As most precisely used, the term refers to infinitesimal amplitudes.

Sensitivity of a phototube is basically defined as the quotient of the current through the tube by the radiant flux received by the cathode. The term "radiant flux" includes both visible radiation (light) and invisible infra-red and ultra-violet radiation. When stated in accordance with this basic definition, sensitivity is usually given in terms of microamperes per microwatt of radiant flux.

For convenience, sensitivity is frequently stated in terms of visible radiation only, and is then known as Luminous Sensitivity. When so stated, it is usually expressed in terms of microamperes per lumen of light flux, and depends on the color of the light or the spectral distribution of the radiant flux used to excite the phototube.

2870 Tungsten Sensitivity is the luminous sensitivity when the incident luminous flux is produced by a tungsten-filament lamp at a color temperature of 2870 degrees Kelvin.

When a phototube is used under steady illumination, its luminous sensitivity is known as Static Luminous Sensitivity. This is defined as the direct anode current produced by the light flux divided by the incident light flux of constant value.

When the light input to a phototube varies, as at audio frequency in sound reproduction, the luminous sensitivity is identified as Dynamic Sensitivity, and may be conveniently defined as the quotient of the amplitude of variation in anode current to the amplitude of variation in light input.

In high-vacuum phototubes, the dynamic sensitivity

DEFINITIONS

(continued from preceding page)

is ordinarily independent of frequency. In gas phototubes, the dynamic sensitivity falls off at the higher frequencies because there is a time lag between the current component produced by the secondary electrons resulting from excited atoms and positive ions arriving at the cathode. As the phase difference between these two components increases with increasing frequency of light variation, the net current variation decreases with consequent reduction in sensitivity. In the application of gas phototubes to audio frequencies, this effect is relatively unimportant but can be compensated for, if desired, in the design of the associated amplifier.

In the design of equipment utilizing phototubes, consideration should always be given to the effect of the time constant of the circuit consisting of the phototube and its associated load in reducing the performance capability of the phototube with increasing frequency.

Transconductance from one electrode to another is the quotient of the in-phase component of the alternating current of the second electrode by the alternating voltage of the first electrode, all other electrode voltages being maintained constant. As most precisely used, the term refers to infinitesimal amplitudes. 1E55

Tube Voltage Drop in a gas or vapor-filled tube is the plate voltage during the conducting period. 1E45

RCA TUBE
HANDBOOK
HB-3

CATHODE-RAY TUBE SECTION

This section pertains to RCA tubes for signal-to-image, image-to-signal, and image-to-image applications. It includes data on cathode-ray tubes for oscillographic and picture-reproduction use, camera tubes for television pickup, and monoscopes for testing the performance of television equipment.

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

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CATHODE-RAY TUBES

RCA

PRICES□
OF CATHODE-RAY TUBE TYPES

Type	Schedule D⊕	Schedule U▲
2AP1-A♣	-	$ 10.55
2BP1	-	9.60
2BP11	-	11.00
2F21	-	105.00
3AP1-A♣	-	15.75
3BP1-A	-	16.50
3JP1	-	19.00
3JP7	-	23.00
3KP1	-	14.50
3KP4♣	$20.00	-
3KP11	-	16.50
3MP1	-	14.75
3RP1	-	14.50
5BP1-A♣	-	22.50
5CP1-A	-	23.25
5CP7-A	-	27.25
5CP11-A	-	27.50
5CP12	-	27.00
5FP4-A	-	41.75
5FP7-A	-	30.25
5FP14	-	30.25
5TP4	60.00	-
5UP1	-	17.75
5UP7	-	20.25
5UP11	-	22.00
5WP11	-	70.00
5WP15	-	70.00
5ZP16	-	71.25
7BP7-A	-	48.50
7CP1	-	30.75
7DP4	31.50	-
7JP1	-	23.50
7JP4	26.00	-
7MP7	-	39.50
7MP14	-	39.50
7NP4	-	600.00
7QP4	-	39.50
7TP4	-	52.00
7VP1	-	25.00
7WP4	-	630.00
9AP4	-	●
10BP4	-	●
10BP4-A	28.00	-
10FP4-A♣	35.00	-
10KP7	-	50.00
10SP4	-	54.00
12AP4*	-	●

Type	Schedule D⊕	Schedule U▲
12DP7-B	-	$ 72.50
12KP4-A♣	$39.50	-
12LP4	-	●
12LP4-A	32.00	-
12SP7	-	47.40
14CP4♣	35.00	-
14EP4	35.00	-
16ADP7	-	55.00
16AP4-A	46.00	-
16DP4-A♣	39.00	-
16GP4	46.00	-
16GP4-A	-	●
16GP4-B	46.00	-
16GP4-C	-	●
16KP4♣	37.00	-
16LP4-A♣	40.00	-
16RP4♣	37.00	-
16TP4♣	37.00	-
16WP4-A♣	40.00	-
17BP4-A	36.00	-
17CP4	35.00	-
17GP4	46.00	-
17HP4	38.25	-
17JP4	36.00	-
17LP4	38.25	-
17QP4	36.00	-
17TP4	36.50	-
19AP4	-	●
19AP4-A	59.00	-
19AP4-B	59.00	-
19AP4-D	-	●
20CP4	51.50	-
20MP4	54.00	-
21AP4	55.00	-
21MP4	57.00	-
902-A♣	-	12.50
905-A♣	-	65.25
908-A♣	-	16.50
912	-	155.00
913♣	-	15.50
914-A	-	93.50
1850-A	-	540.00
5527	-	49.90
5820	-	1200.00
5826	-	1300.00
6198	-	360.00

● Discontinued type. Data sheet has been retained in book for reference purpose only.

□,⊕,▲,♣,*: See next page.

PRICES□
OF CATHODE-RAY TUBE TYPES

□ This price list applies only in the United States of America and is subject to change without notice. All prices are exclusive of all Federal, State and local excise, sales, and similar taxes.

● Schedule D shows list prices for tube types priced for distribution through dealer and service channels.

▲ Schedule U shows list prices for tube types priced for distribution through other than dealer and service channels.

♣ Not recommended for new equipment design.

* For data see 9AP4/1804-P4 and 12AP4/1803-P4, respectively.

INFORMATION ON PURCHASING ABOVE TYPES

Information as to where *RCA Cathode-Ray Tube Types* can be purchased may be obtained from our *regional office* nearest you or from *Tube Department, Radio Corporation of America, Harrison, N.J.*

CLASSIFICATION CHART
FOR TYPES IN
CATHODE-RAY TUBE SECTION

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.

KINESCOPES

Envelope	Focusing Method	Deflection Method	Aluminized Screen	Minimum Screen Size Inches	Max. Ultor Volts●	TUBE TYPE
Direct-Viewing						
Black & White						
(G)	E	M	No	6 Dia.	8000	7DP4
(G)	E	E	No	6 Dia.	6000	7JP4
(G)	M	M	No	9-1/8 Dia.	12000	10BP4-A
(G)	M	M	Yes	9-1/8 Dia.	12000	10FP4-A
(G)	M	M	Yes	11-1/8 Dia.	12000	12KP4-A
(G)	M	M	No	11 Dia.	12000	12LP4-A
[G]	M	M	No	11-3/8 x 8-1/2	14000	14EP4/ 14CP4
[G]	E	M	No	11-3/8 x 8-1/2	14000	14HP4
(M)	M	M	No	14-3/8 Dia.	14000	16AP4-A
(G)	M	M	No	14-1/2 Dia.	15000	16DP4-A
(M)	M	M	No	14-3/8 Dia.	14000	16GP4-B
(G)	M	M	No	14-1/2 Dia.	14000	16LP4-A
[G]	M	M	No	13-1/2 x 10-1/8	16000	16RP4/ 16KP4
[G]	M	M	Yes	13-1/2 x 10-1/8	16000	16RP4-A/ 16KP4-A
[G]	M	M	No	13-1/2 x 10-1/8	14000	16TP4
(G)	M	M	No	14-1/2 Dia.	16000	16WP4-A
[G]	E	M	No	14-1/4 x 10-3/4	16000	17AVP4
[G]	E	M	Yes	14-1/4 x 10-3/4	16000	17AVP4-A
[G]	M	M	No	14-1/4 x 10-3/4	16000	17BP4-A
[G]	M	M	Yes	14-1/4 x 10-3/4	16000	17BP4-B
[M]	M	M	No	14-3/8 x 10-11/16	16000	17CP4
[M]	E	M	No	14-3/8 x 10-11/16	16000	17GP4
[G]	E	M	No	14-1/4 x 10-3/4	16000	17HP4/ 17RP4
[G]	E	M	Yes	14-1/4 x 10-3/4	16000	17HP4-B
[G]	M	M	No	14-1/4 x 10-3/4	18000	17JP4
[G]	E	M	Yes	14-1/4 x 10-3/4	16000	17LP4/ 17VP4
[G]	E	M	Yes	14-1/4 x 10-3/4	16000	17LP4-A
[G]	M	M	No	14-1/4 x 10-3/4	16000	17QP4
[G]	M	M	Yes	14-1/4 x 10-3/4	18000	17QP4-A
[M]	E	M	No	14-3/8 x 10-11/16	16000	17TP4
(M)	M	M	No	17-1/4 Dia.	16000	19AP4-B

● Design-center values.

[G] = Glass rectangular. (G) = Glass round. E = Electrostatic.
[M] = Metal rectangular. (M) = Metal round. M = Magnetic.

CLASSIFICATION CHART
FOR TYPES IN
CATHODE-RAY TUBE SECTION

KINESCOPES (Cont'd)						
Envelope	**Focusing Method**	**Deflection Method**	**Aluminized Screen**	**Minimum Screen Size Inches**	**Max. Ultor Volts●**	**TUBE TYPE**
Direct-Viewing						
Black & White						
[G]	M	M	No	17 x 12-3/4	18000	20CP4
[G]	M	M	No	17 x 12-3/4	18000	20DP4-A/ 20CP4-A
[G]	M	M	Yes	17 x 12-3/4	18000	20DP4-C/ 20CP4-D
[G]	E	M	No	17 x 12-3/4	16000	20HP4-A/ 20MP4
[G]	E	M	Yes	17 x 12-3/4	16000	20HP4-D
[G]	M	M	Yes	19-1/8 x 15	20000	21ACP4-A
[G]	E	M	Yes	19-1/8 x 15	18000	21ALP4-A
[G]	E	M	Yes	19-1/8 x 15	20000	21ALP4-B
[G]	M	M	Yes	19-1/8 x 15	18000	21AMP4-A
[M]	M	M	No	18-1/8 x 13-11/16	18000	21AP4
[G]	E	M	Yes	19-1/8 x 15	18000	21ATP4
[G]	E	M	No	19-1/8 x 15	18000	21AVP4/ 21AUP4
[G]	E	M	Yes	19-1/8 x 15	18000	21AVP4-A/ 21AUP4-A
[G]	M	M	Yes	19-1/8 x 15	18000	21AWP4
[G]	M	M	No	19-1/8 x 13-7/8	18000	21EP4-A
[G]	M	M	Yes	19-1/8 x 13-7/8	18000	21EP4-B
[G]	E	M	No	19-1/8 x 13-7/8	18000	21FP4-A
[G]	E	M	Yes	19-1/8 x 13-7/8	18000	21FP4-C
[M]	E	M	No	18-1/8 x 13-11/16	16000	21MP4
[G]	E	M	No	19-1/8 x 14-3/16	18000	21YP4
[G]	E	M	Yes	19-1/8 x 14-3/16	18000	21YP4-A
[G]	M	M	No	19-1/8 x 14-3/16	18000	21ZP4-A
[G]	M	M	Yes	19-1/8 x 14-3/16	18000	21ZP4-B
[G]	M	M	Yes	21-1/4 x 16-3/4	20000	24CP4-A
[G]	E	M	Yes	21-1/4 x 16-3/4	20000	24DP4-A
[G]	E	M	Yes	21-1/4 x 16-3/4	20000	24YP4
[M]	M	M	Yes	23-7/16 x 18-1/8	18000	27MP4
Color						
(G)	E	M	Yes	11-1/2 x 8-5/8	20000	15GP22
[M]	E	M	Yes	19-1/16 x 15-1/4	25000	21AXP22
Monitor						
(G)	M	M	No	6 Dia.	10000	7QP4
(G)	E	M	Yes	6 Dia.	12000	7TP4
(G)	E	M	Yes	9-1/8 Dia.	14000	10SP4

[G] = Glass rectangular. (G) = Glass round. E = Electrostatic.
[M] = Metal rectangular. ● = Design-center values. M = Magnetic.

CLASSIFICATION CHART
FOR TYPES IN
CATHODE-RAY TUBE SECTION

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.

KINESCOPES (Cont'd)

Envelope	Focusing Method	Deflection Method	Aluminized Screen	Minimum Screen Size Inches	Max. Ultor Volts⊕	TUBE TYPE
Projection						
Ⓖ	E	M	Yes	4-1/4 Dia.■	40000†	5AZP4
Ⓖ	E	M	Yes	4-1/4 Dia.●	27000	5TP4
Ⓖ	E	M	Yes	5 x 3-3/4▲	80000†	7NP4
Ⓖ	E	M	Yes	5 x 3-3/4*	80000†	7WP4
View-Finder						
Ⓖ	E	M	Yes	4-1/4 Dia.	10000	5AYP4
Ⓖ	M	M	No	4-1/4 Dia.	8000	5FP4-A
Transcriber						
Ⓖ	E	M	Yes	4-1/4 Dia.	27000	5WP11

CAMERA TUBES

Major Use	Focusing Method	Deflection Method	Image Size Inches	TUBE TYPE
Iconoscopes				
Film Pickup	E	M	4-3/4 x 3-9/16	1850-A
Industrial & Laboratory	E	E	1.4 Diagonal	5527
Image Orthicons				
Outdoor & Studio Pickup	M	M	1.6 Diagonal	5820
Color Pickup	M	M	1.6 Diagonal	6474/1854
Vidicons				
Industrial	M	M	0.62 Diagonal	6198
Film Pickup	M	M	0.62 Diagonal	6326

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

● 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'.

⊕ Design-center values except as noted. † Absolute value.

Ⓖ = Round glass. E = Electrostatic. M = Magnetic.

RCA

CLASSIFICATION CHART
FOR TYPES IN
CATHODE-RAY TUBE SECTION

OSCILLOGRAPH TUBES

Approx. Bulb Dia. Inches	Max. Ultor Volts⊕	TUBE TYPES Classified by Phosphor♦						
		P1	P4	P5	P7	P11	P12	P14
Electrostatic Focus and Deflection								
2	600	902-A	–	–	–	–	–	–
2	1000	2AP1-A	–	–	–	–	–	–
2	2500	2BP1	–	–	–	2BP11	–	–
3	1500	3AP1-A	–	908-A	–	–	–	–
3	2000	3BP1-A	–	–	–	–	–	–
3	2500	3KP1	3KP4	–	–	3KP11	–	–
3	2500	3MP1	–	–	–	–	–	–
3	2500	3RP1 3RP1-A▲	3RP4	–	–	–	–	–
5	2000	5BP1-A	–	–	–	–	–	–
5	2500	5UP1	–	–	5UP7	5UP11	–	–
5	15000	912	–	–	–	–	–	–
7	4000	7VP1	–	–	–	–	–	–
9	7000	914-A	–	–	–	–	–	–
Post-Deflection Accelerator Types								
3	4000●	3JP1	–	–	3JP7	–	–	–
5	6000●	5ABP1	5ABP4	–	5ABP7	5ABP11	–	–
5	4000●	5CP1-A	–	–	5CP7-A	5CP11-A	5CP12	–
Magnetic Focus and Deflection								
5	8000	–	–	–	5FP7-A	–	–	5FP14
7	8000	–	–	–	7BP7-A	–	–	–
7	8000	–	–	–	7MP7	–	–	7MP14
10	10000	–	–	–	10KP7	–	–	–
12	10000	–	–	–	12DP7-A 12DP7-B■	–	–	–
16	14000	–	–	–	16ADP7	–	–	–
Electrostatic Focus, Magnetic Deflection								
7	8000	7CP1	–	–	–	–	–	–

⊕ Design-center values.
♦ See sheet FEATURES OF FLUORESCENT SCREENS.
▲ Similar to 3RP1 except for flat faceplate.
● Maximum post-ultor volts.
■ Similar to 12DP7-A except for Filterglass faceplate.

CLASSIFICATION CHART
FOR TYPES IN
CATHODE-RAY TUBE SECTION

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.

MISCELLANEOUS

Approx. Bulb Dia. Inches	Phosphor♦	Maximum Ultor Volts⊕	Focus-ing Method	Deflec-tion Method	TUBE TYPE
Computer Storage Tube					
3	Storage Surface	2500	E	E	6571
Flying-Spot Cathode-Ray Tubes					
Black & White					
5	P15	27000	E	M	5WP15
5	P16	27000	E	M	5ZP16
Color					
5	P24	27000	E	M	5AUP24
Monoscope					
5	Resolution Chart	1500	E	M	2F21

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

FEATURES OF FLUORESCENT SCREENS

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

Phosphor P1 produces a brilliant spot having 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 P4 is a highly efficient screen having white fluorescence and medium persistence. Types having this phosphor are of particular interest for television picture tubes.

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

Phosphor P7 is a long-persistence, cascade (two-layer) screen. During excitation by the electron beam, this phosphor produces a bluish fluorescence of short persistence. After excitation, the screen exhibits a greenish-yellow 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 bluish fluorescence and has sufficiently short persistence to permit its use in all moving film photographic applications without blurring except in those where film moves at a high speed. P11 screens, because of their unusually high brightness characteristic, may also be used for visual observation of phenomena.

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

Phosphor P14 is a medium-long-persistence cascade (two-layer) screen. During excitation by the electron beam, this phosphor exhibits purple fluorescence of short persistence. After excitation, it exhibits an 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.

Phosphor P15 produces a spot of very short persistence and having both blue-green and near-ultraviolet fluorescence. The persistence of the latter is even shorter than that of the blue-green fluorescence, a feature which makes this phosphor particularly suitable for the high-speed scanning requirements of a flying-spot signal generator.

FEATURES OF FLUORESCENT SCREENS

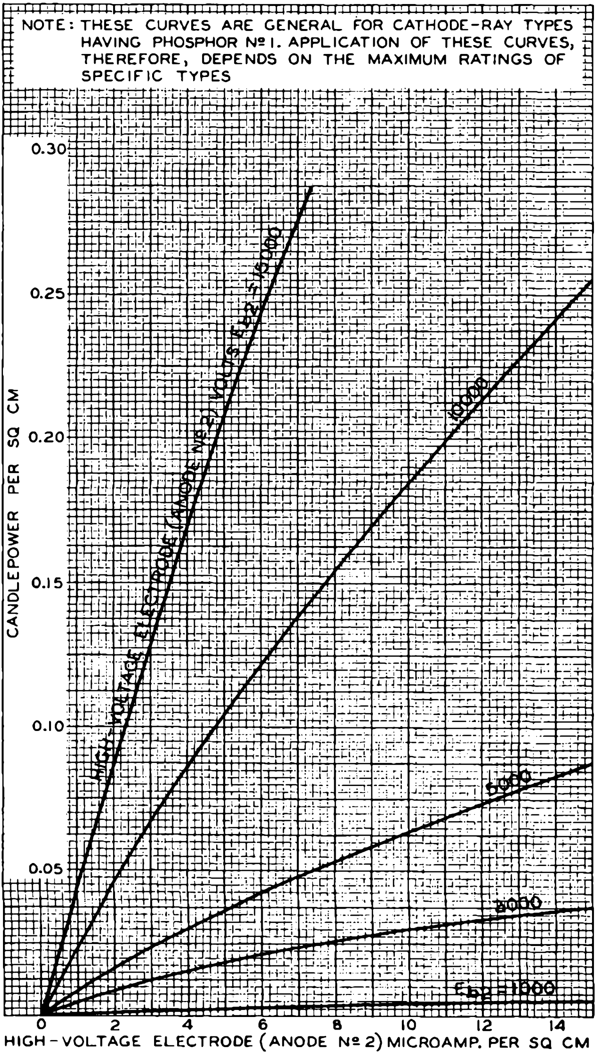
Phosphor P16 produces a spot of extremely short persistence and has both violet and near-ultra violet fluorescence and phosphorescence. This phosphor is particularly useful for the high-speed scanning requirements of a flying-spot signal generator because it features a stable exponential decay characteristic.

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 has a spectral-energy emission characteristic with peak in the blue-green region and with sufficient range to provide useable energy over the visible spectrum required for generating color signals from color transparencies. The persistence of the phosphor is extremely short.

RCA

AVERAGE CHARACTERISTICS OF PHOSPHOR Nº 1



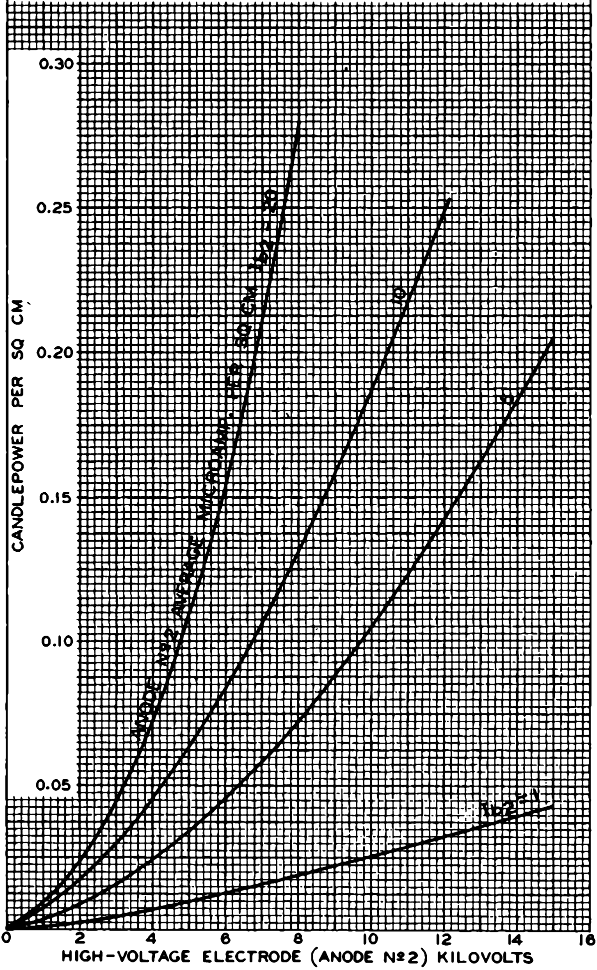
NOV. 23, 1938

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC

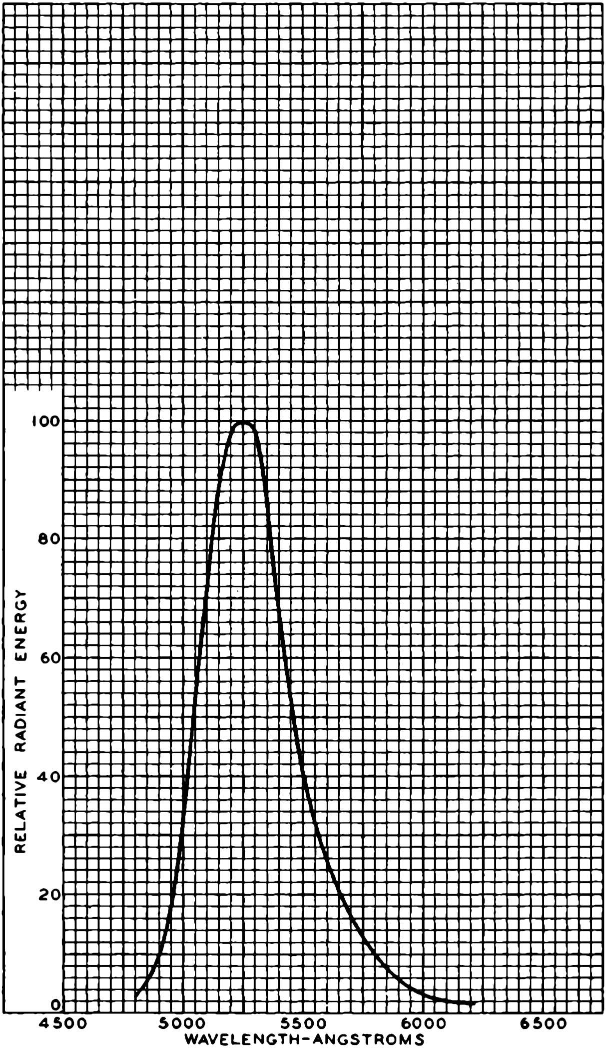
92C-6010

AVERAGE CHARACTERISTICS OF PHOSPHOR Nº 1

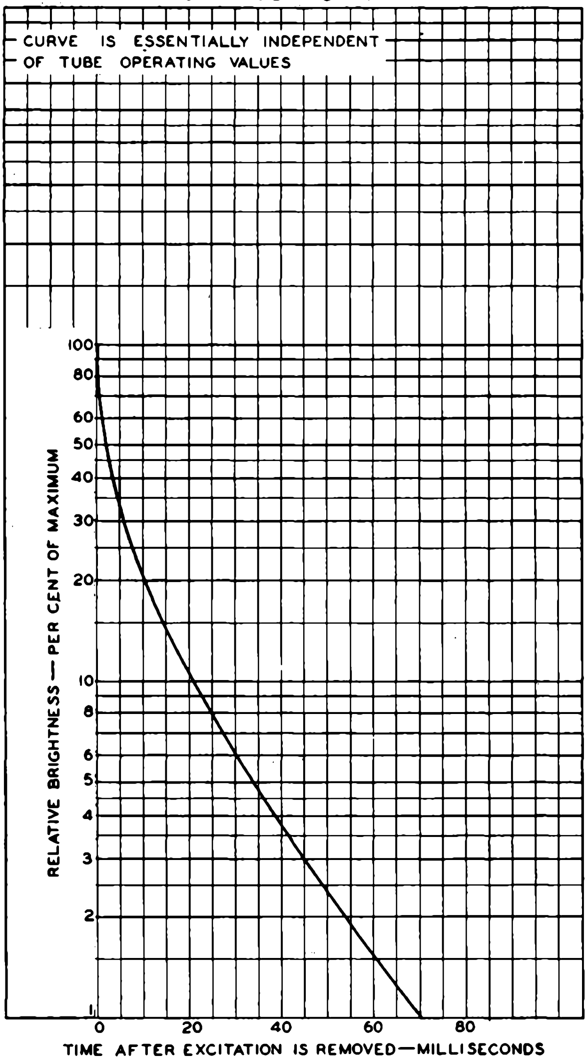
NOTE: THESE CURVES ARE GENERAL FOR CATHODE-RAY TYPES HAVING PHOSPHOR Nº1. APPLICATION OF THESE CURVES, THEREFORE, DEPENDS ON THE MAXIMUM RATINGS OF SPECIFIC TYPES



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P1



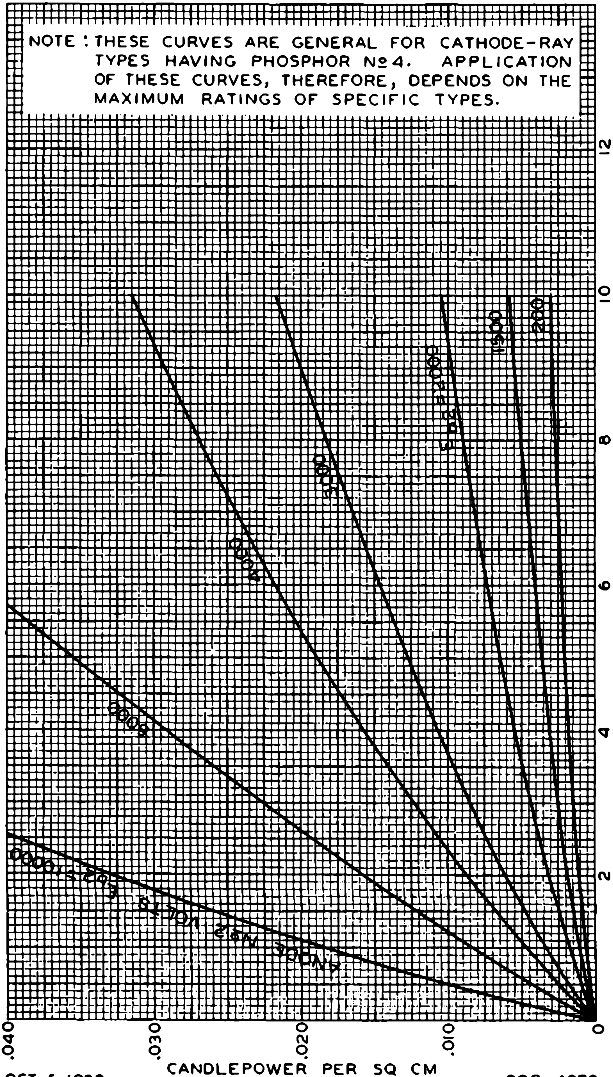
PERSISTENCE CHARACTERISTIC OF PHOSPHOR P1



FEB. 1, 1951 — TUBE DIVISION — 92CM-5380R2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

AVERAGE CHARACTERISTICS OF PHOSPHOR №4



OCT. 5, 1938

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

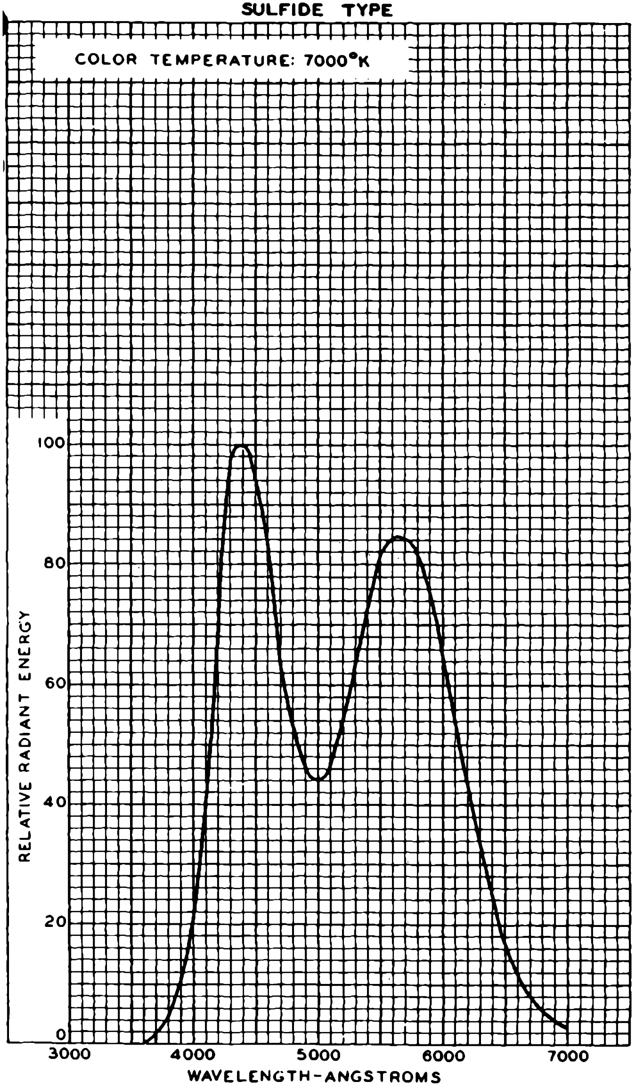
92C-4979

AVERAGE CHARACTERISTICS OF PHOSPHOR №4

OCT. 5, 1938 RCA RADIOTRON DIVISION 92C-4978

RCA MANUFACTURING COMPANY, INC.

SPECTRAL-ENERGY EMISSION CHARACTERISTIC
OF PHOSPHOR No 4
SULFIDE TYPE



JULY 5, 1949

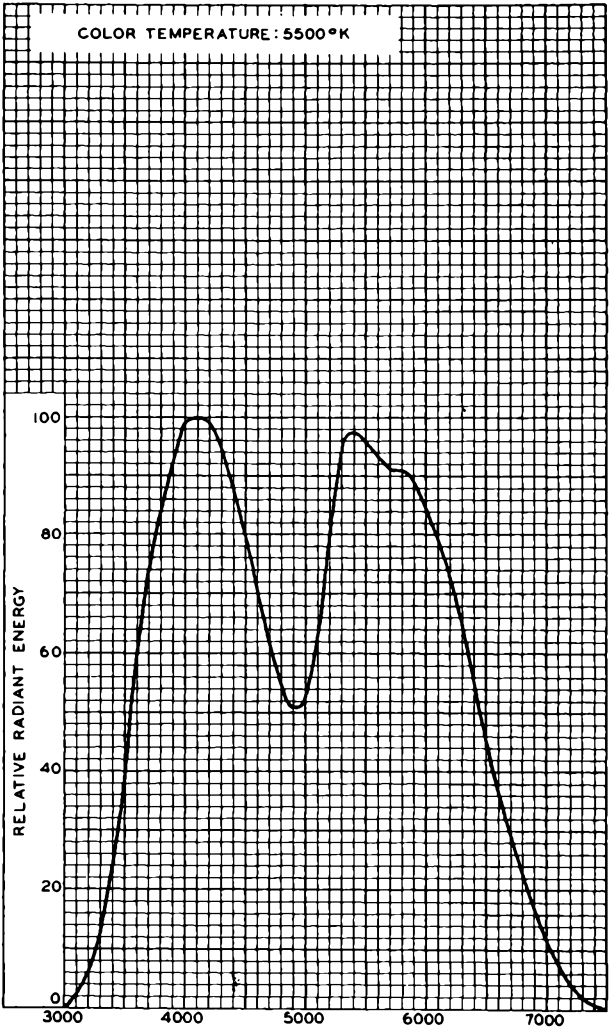
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7316

PERSISTENCE CHARACTERISTIC OF PHOSPOR № 4
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



AUG. 2, 1949

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

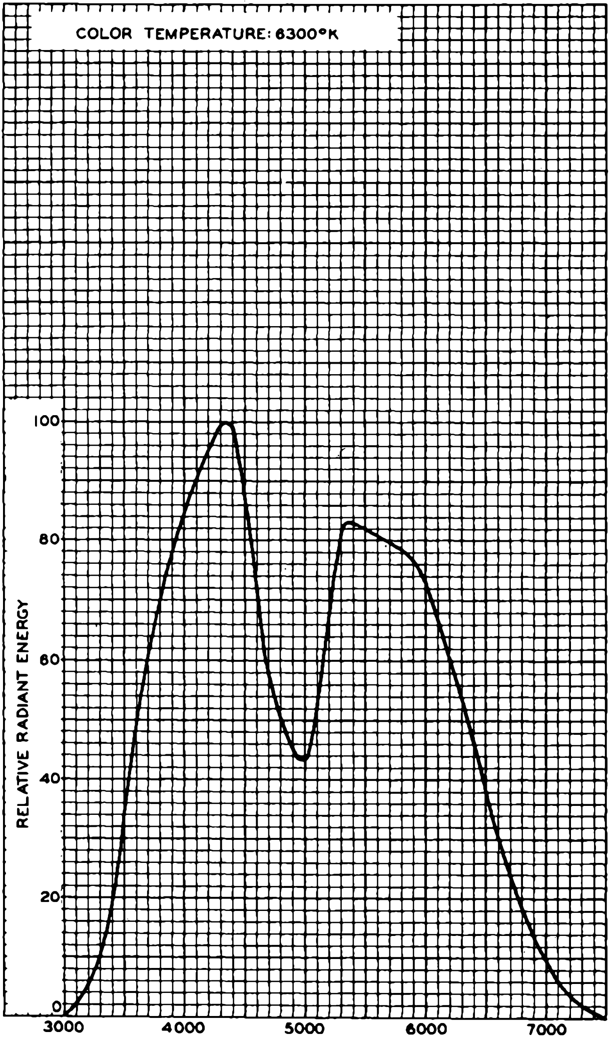
92CM-7335

PERSISTENCE CHARACTERISTIC OF PHOSPOR P4
SILICATE TYPE

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

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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



MARCH 8, 1950 — TUBE DEPARTMENT — 92CM-7458

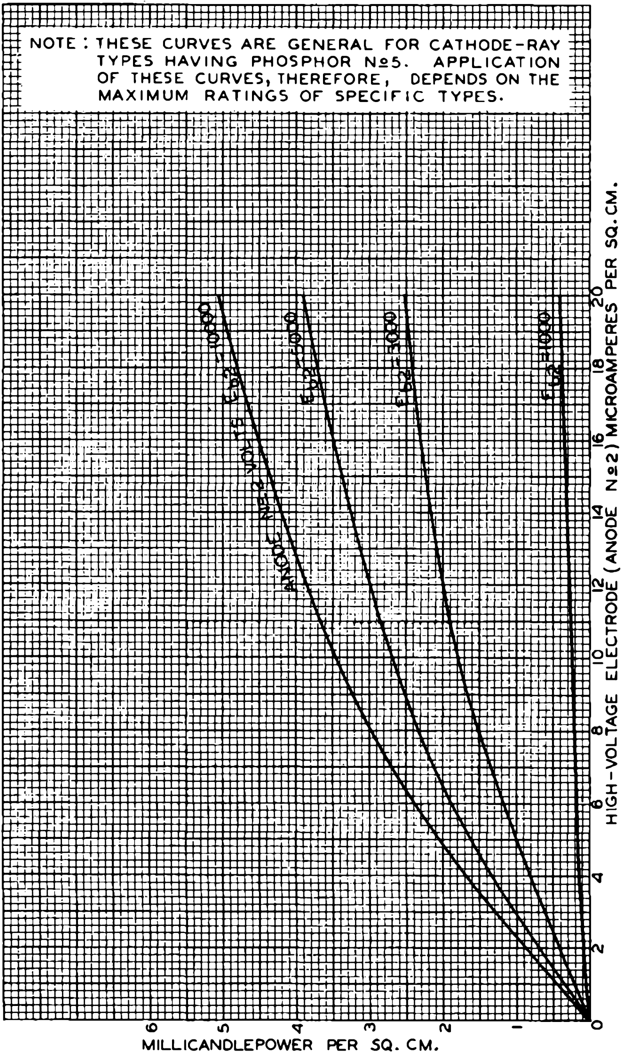
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

PERSISTENCE CHARACTERISTIC OF PHOSPOR № 4

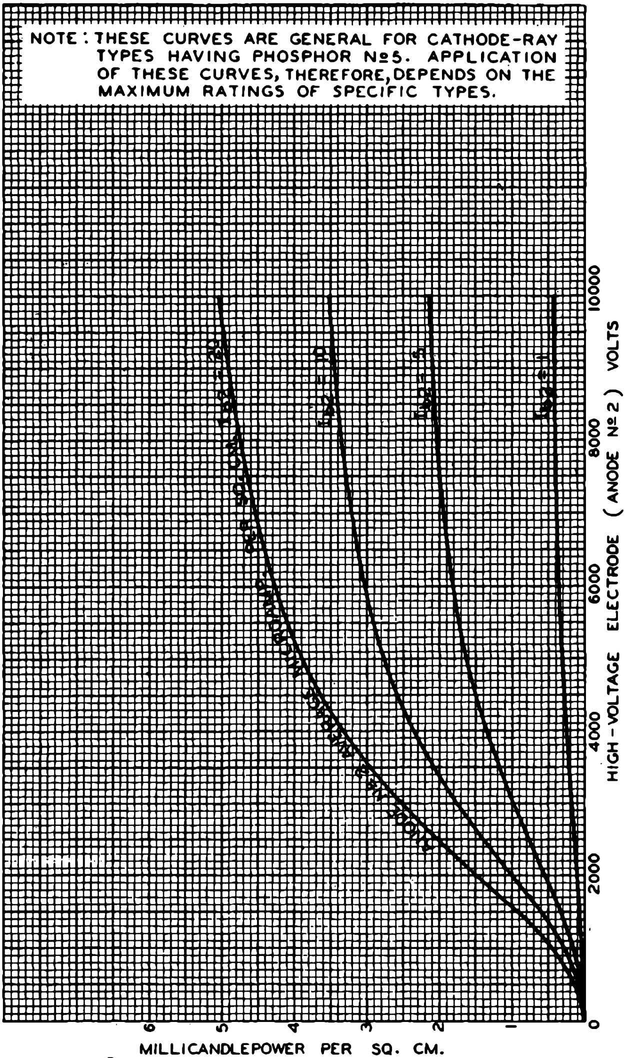
SILICATE-SULFIDE TYPE

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.

AVERAGE CHARACTERISTICS OF PHOSPHOR №5



AVERAGE CHARACTERISTICS OF PHOSPHOR №5

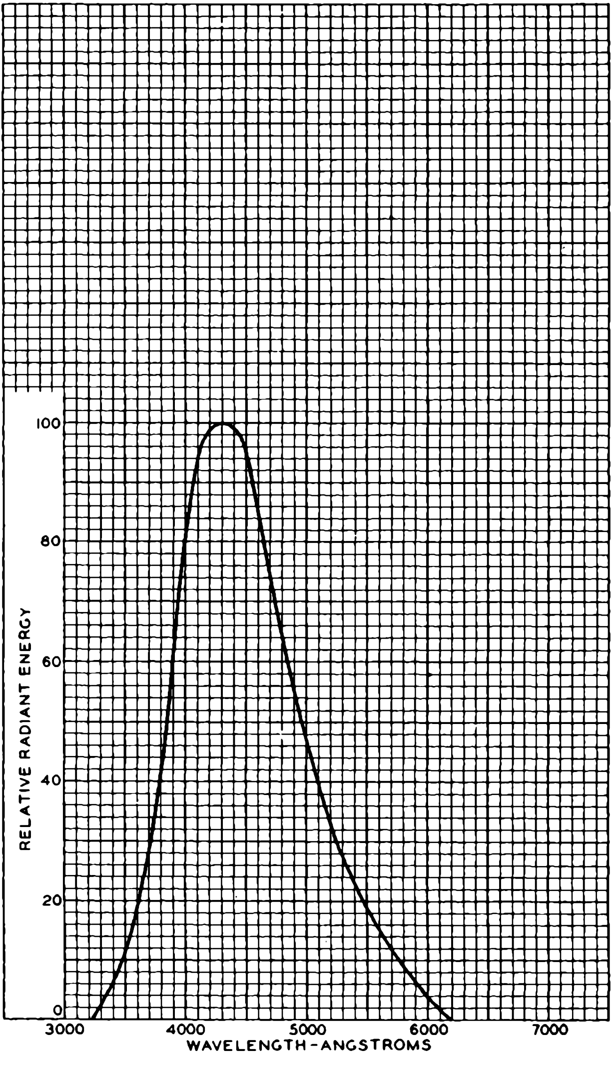


AUG. 22, 1934

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-5562

SPECTRAL-ENERGY EMISSION CHARACTERISTIC
OF PHOSPHOR Nº 5

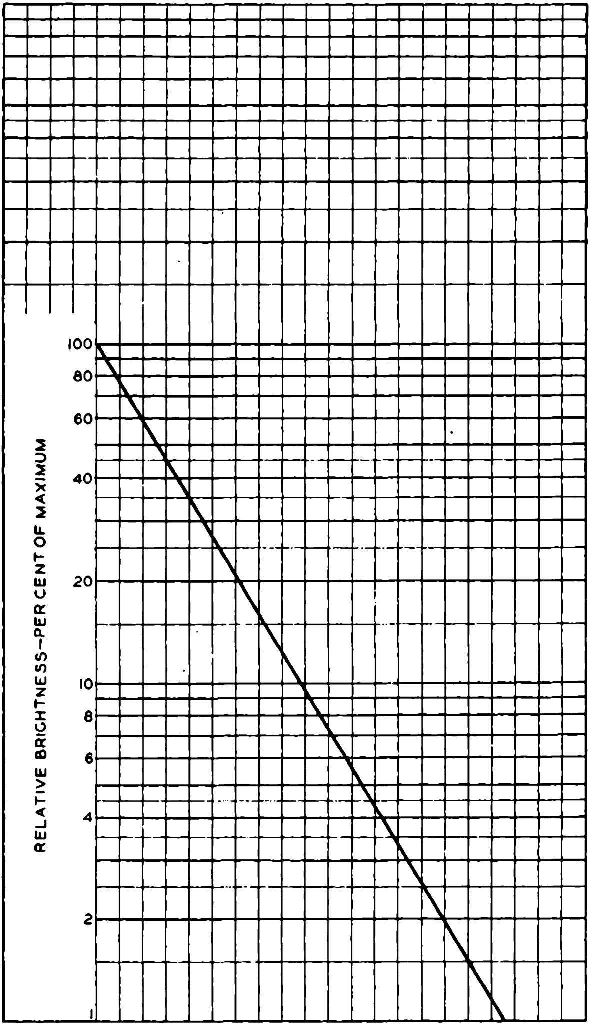


MAY 2, 1949

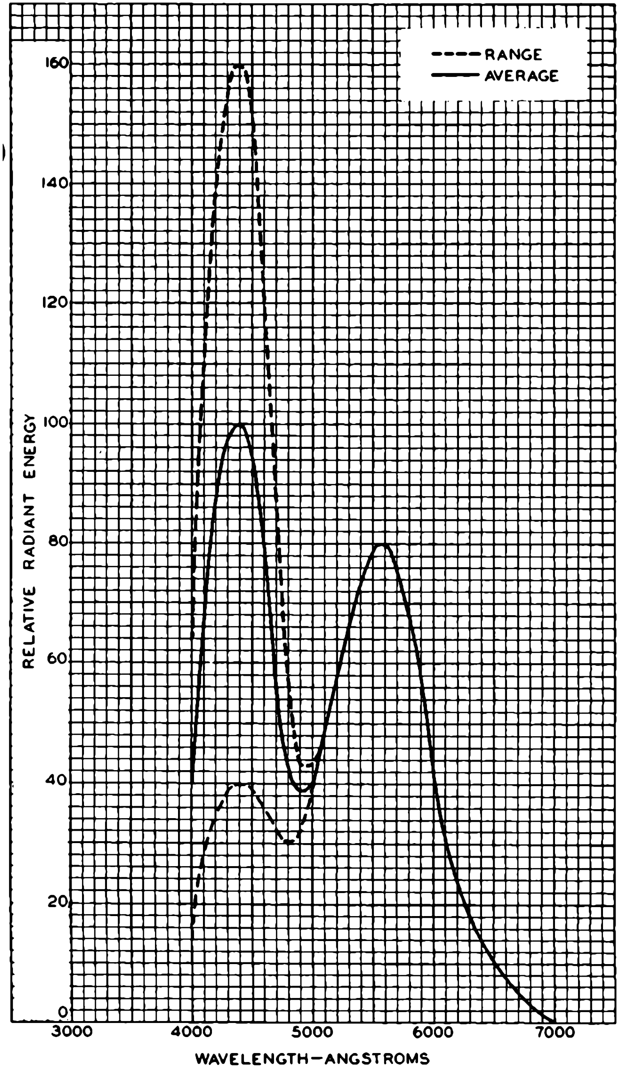
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-5559R2

PERSISTENCE CHARACTERISTIC OF PHOSPHOR № 5



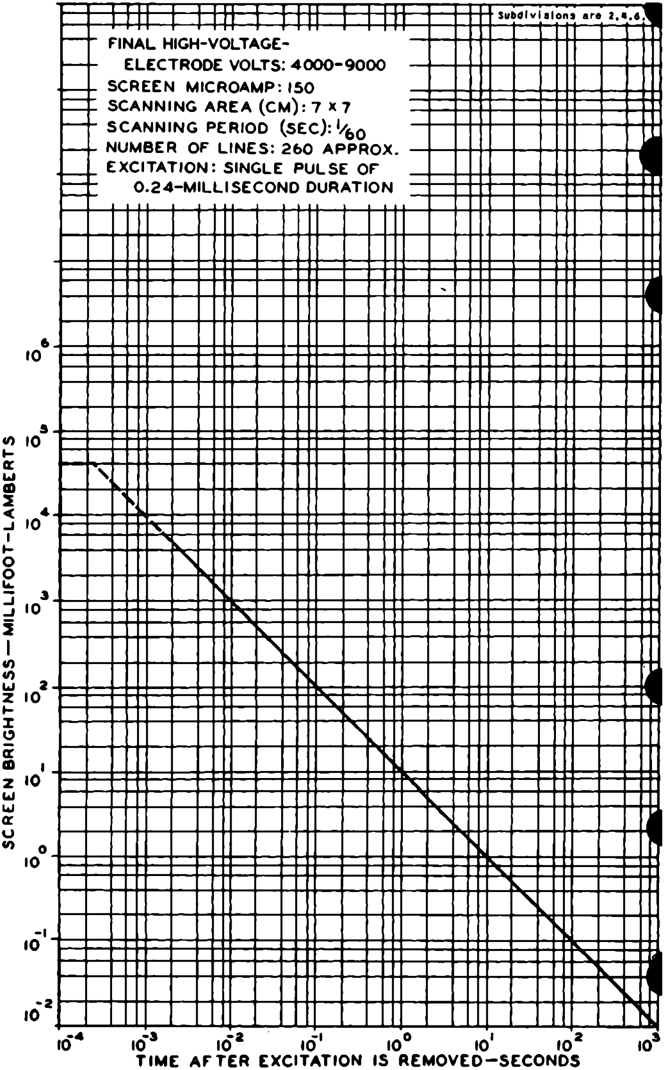
SPECTRAL-ENERGY EMISSION CHARACTERISTIC
OF PHOSPHOR P7



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

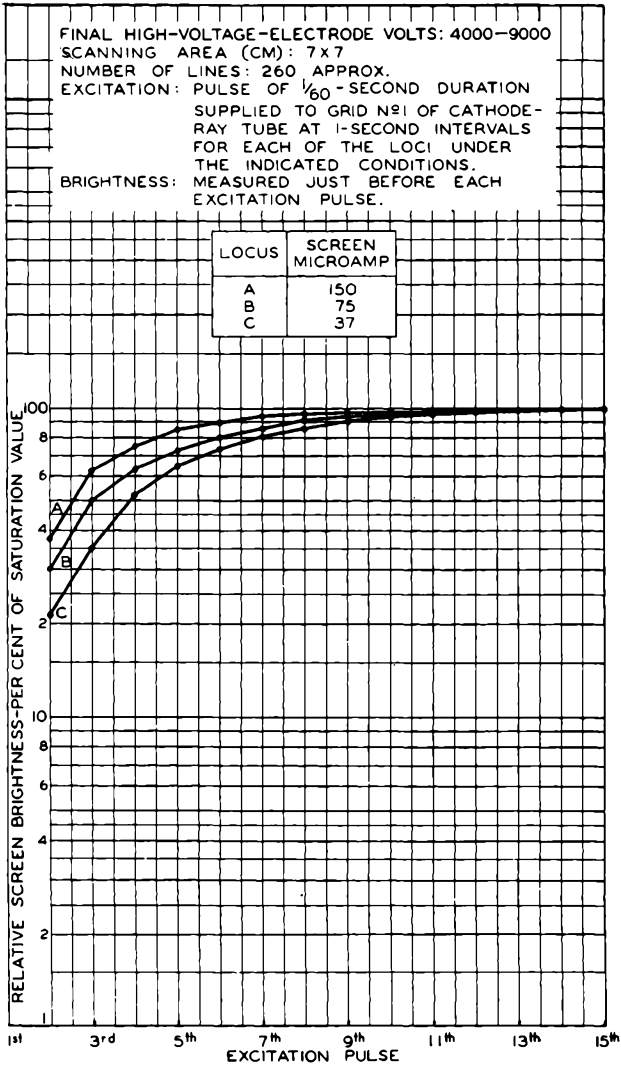
92CM-7336

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P7



RCA

BUILDUP CHARACTERISTICS OF PHOSPHOR P7



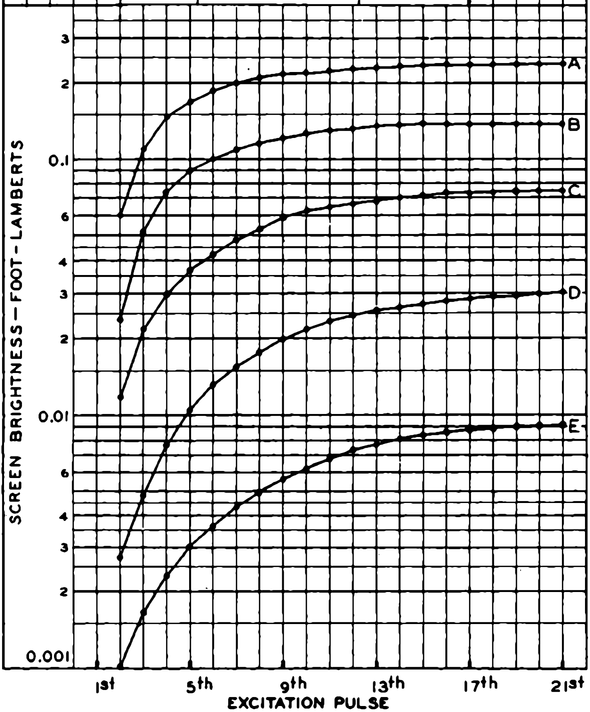
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7019R3

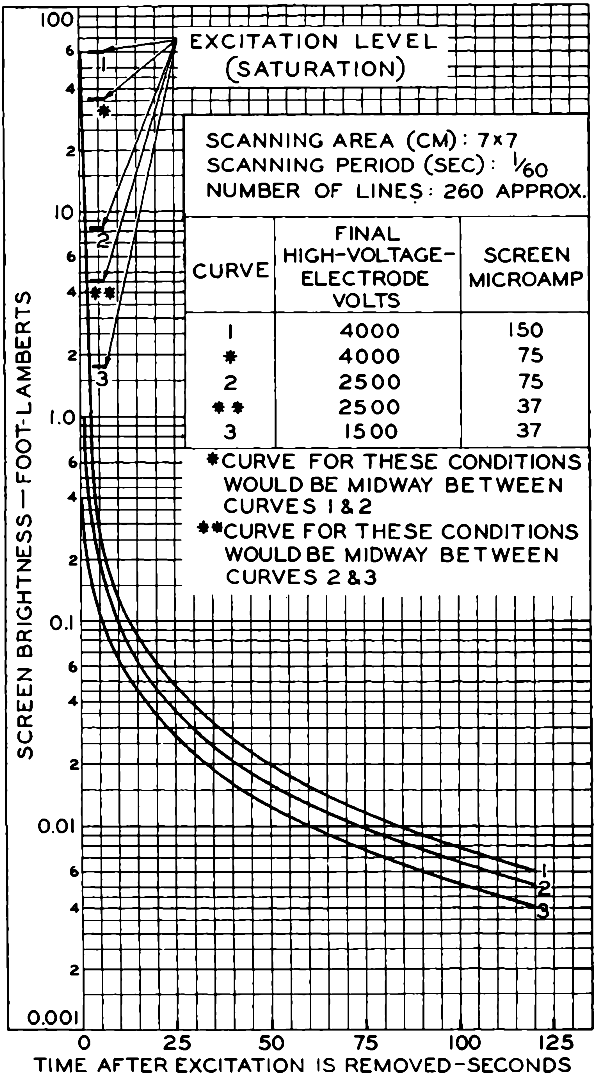
BUILDUP CHARACTERISTICS OF PHOSPHOR P7

SCANNING AREA (CM): 7x7
NUMBER OF LINES: 260 APPROX.
EXCITATION: PULSE OF 1/60-SECOND DURATION SUPPLIED TO GRID Nº1 OF CATHODE-RAY TUBE AT 1-SECOND INTERVALS FOR EACH OF THE LOCI UNDER THE INDICATED CONDITIONS.
BRIGHTNESS: MEASURED JUST BEFORE EACH EXCITATION PULSE.

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



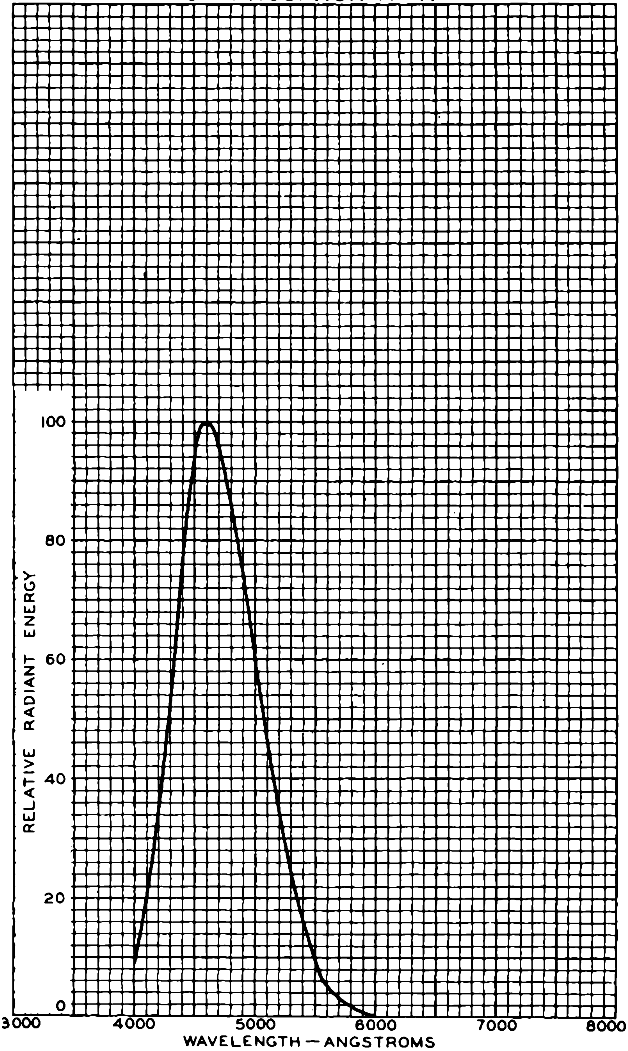
PERSISTENCE CHARACTERISTICS OF PHOSPHOR P7



TUBE DIVISION 92CL-6804R5

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR № 11

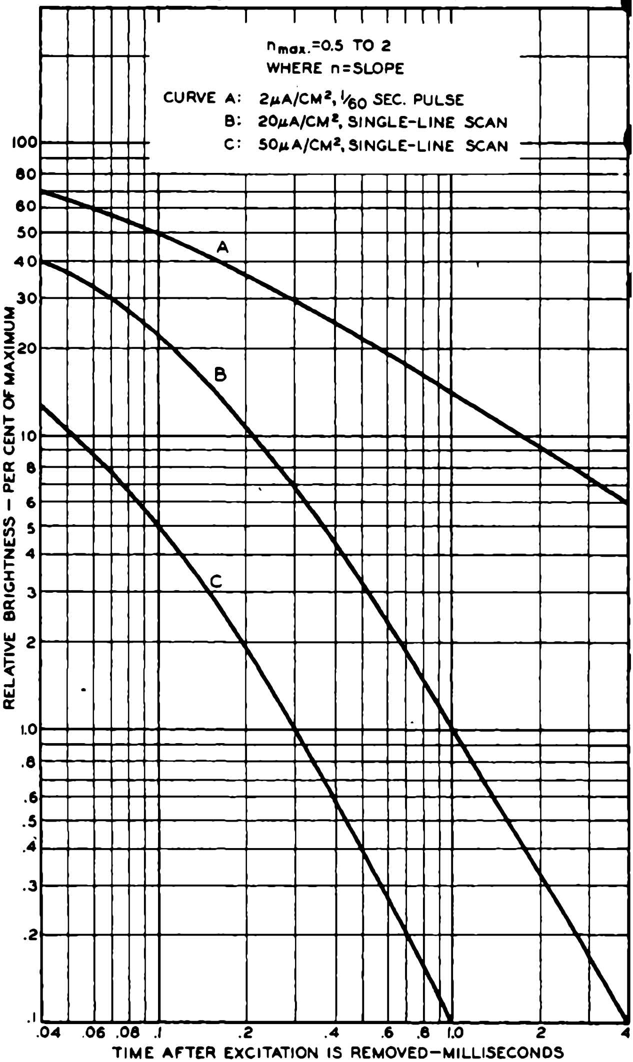


APRIL 9, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6749

PERSISTENCE CHARACTERISTICS OF PHOSPHOR №11

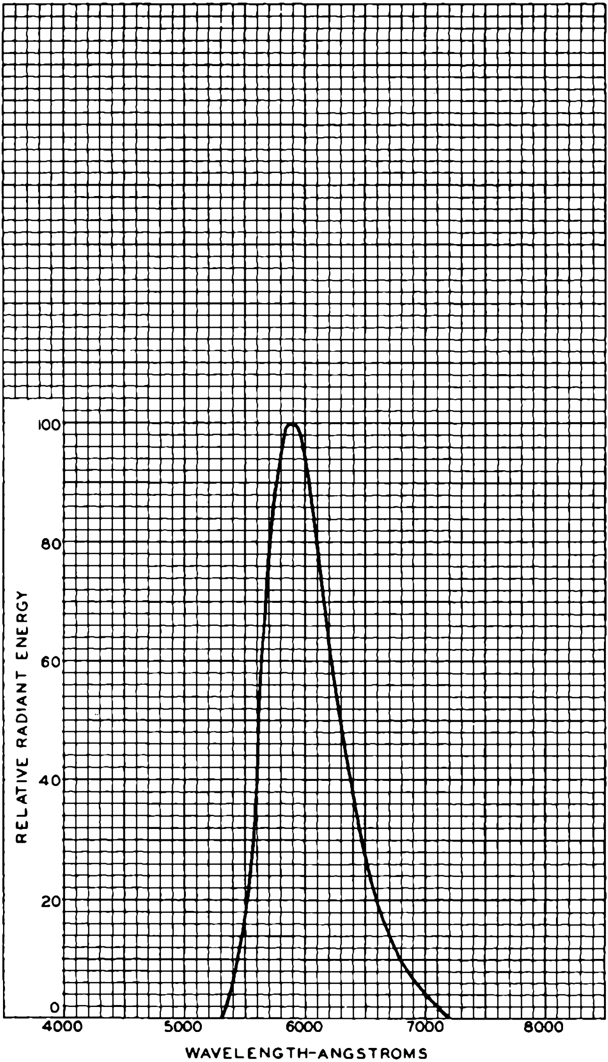


JULY 7, 1950

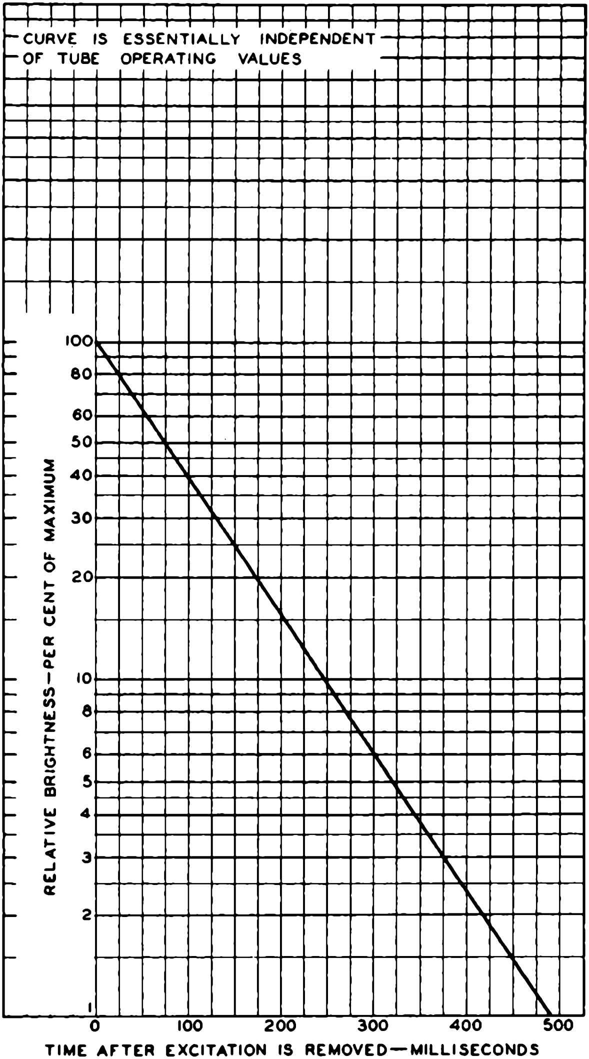
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6806R2

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P12



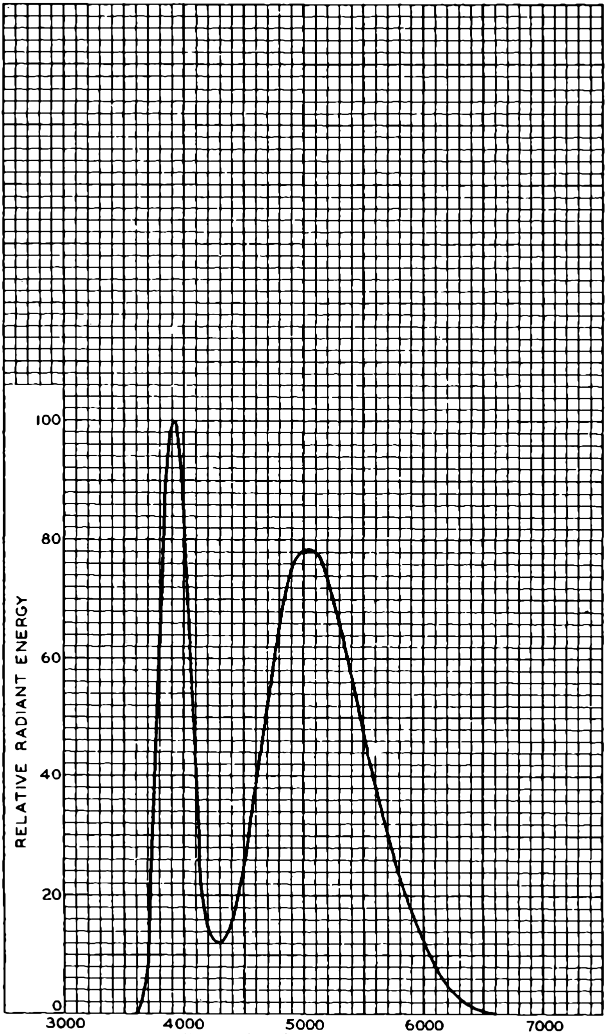
PERSISTENCE CHARACTERISTIC OF PHOSPHOR P12



FEB. 1, 1951 TUBE DEPARTMENT 92CM-7318R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

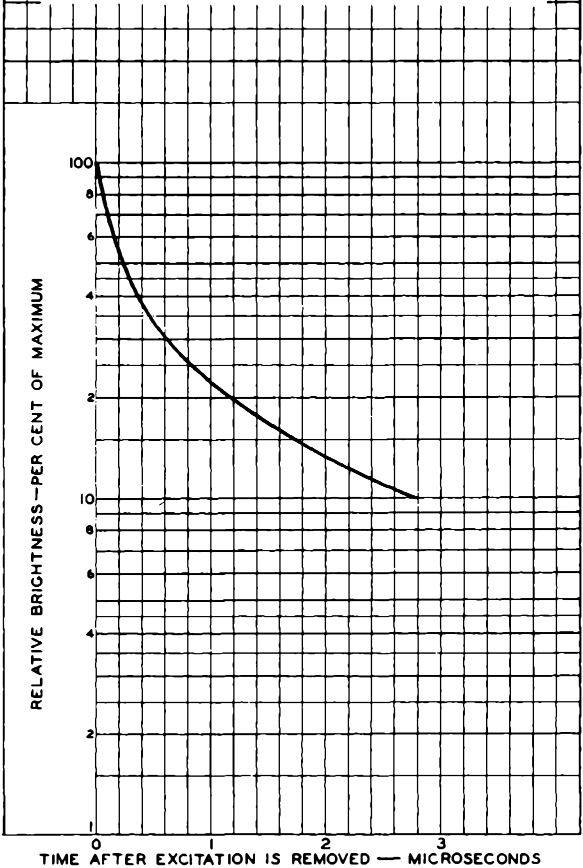
SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P15



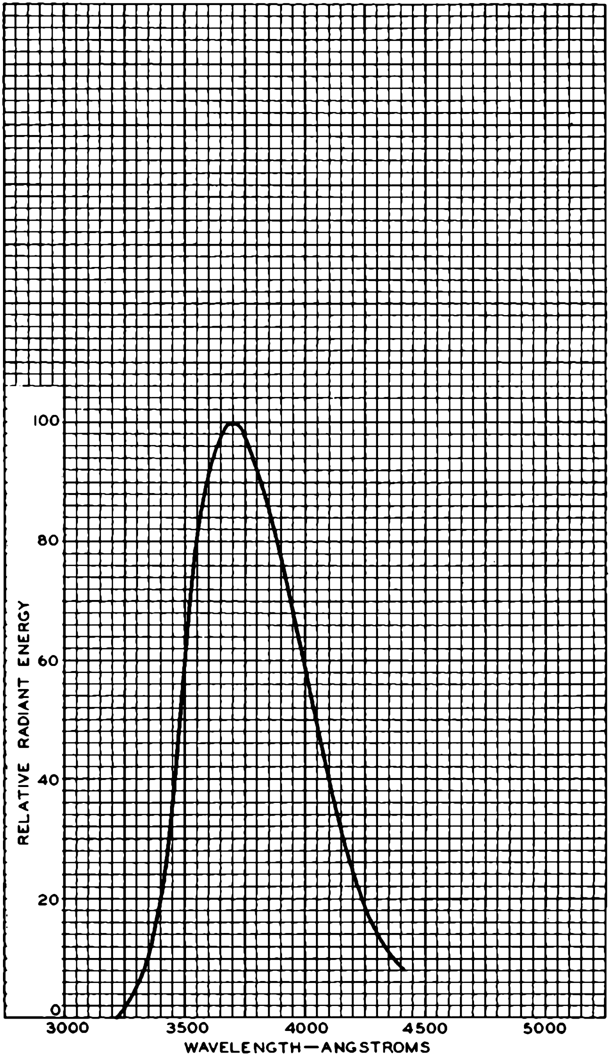
PERSISTENCE CHARACTERISTIC OF PHOSPHOR P15

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

SPOT: SHARPLY FOCUSED



SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P16



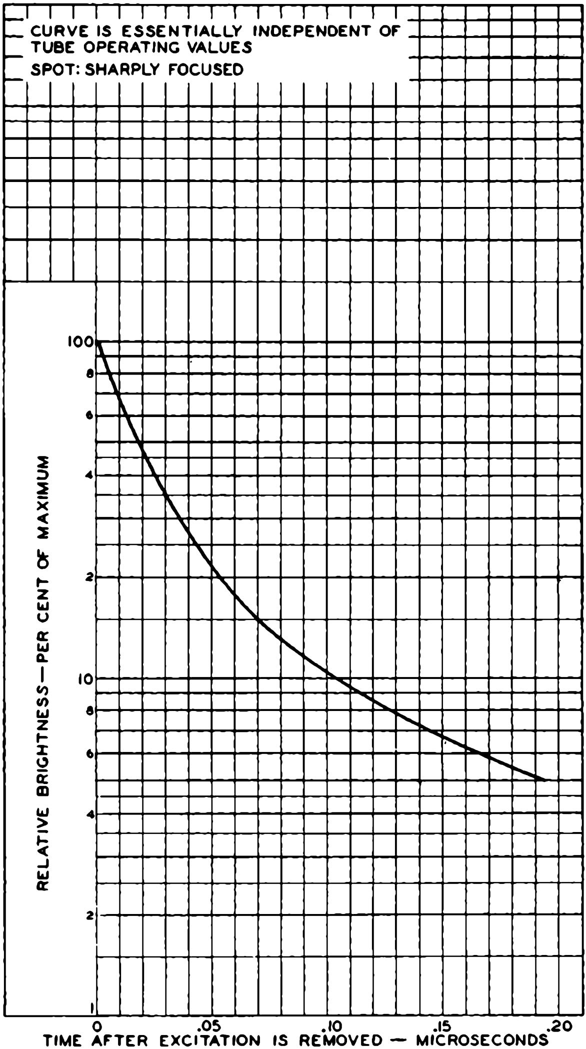
OCT. 30, 1950

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7563

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P16



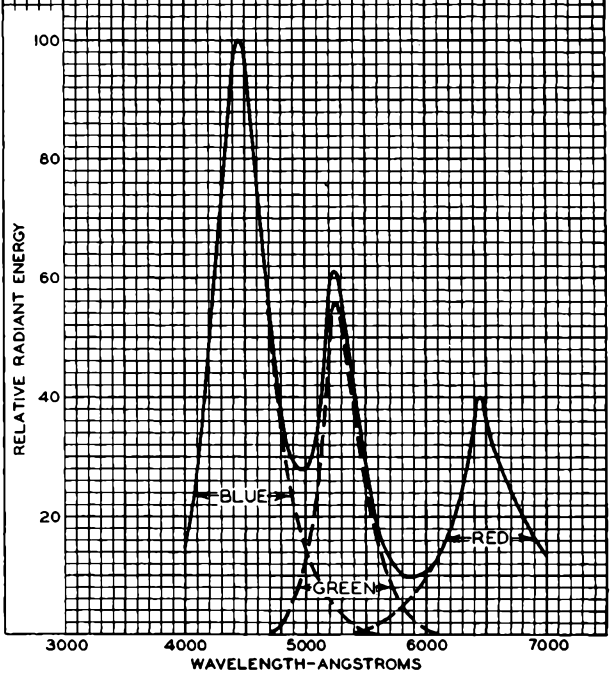
FEB. 23, 1955 TUBE DIVISION 92CM-7564R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF GROUP PHOSPHOR P22

EQUAL EXCITATION OF EACH PHOSPHOR

PHOSPHOR	RANGE OF MAX. VALUE ANGSTROMS
BLUE EMITTING	4420 TO 4520
GREEN EMITTING	5230 TO 5270
RED EMITTING	6360 TO 6580

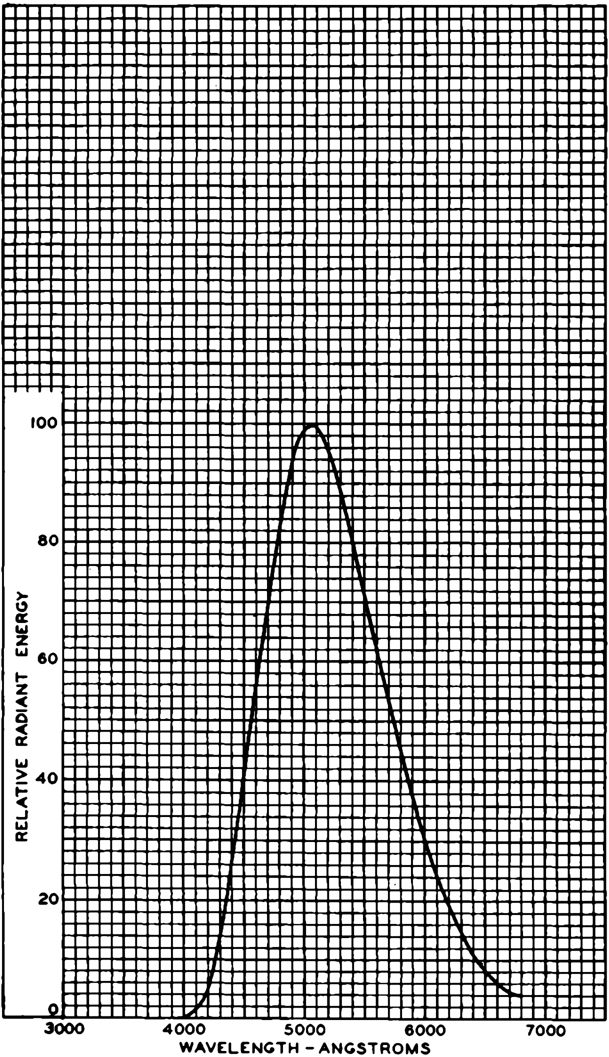


PERSISTENCE CHARACTERISTIC OF GROUP PHOSPHOR P22

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.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P24

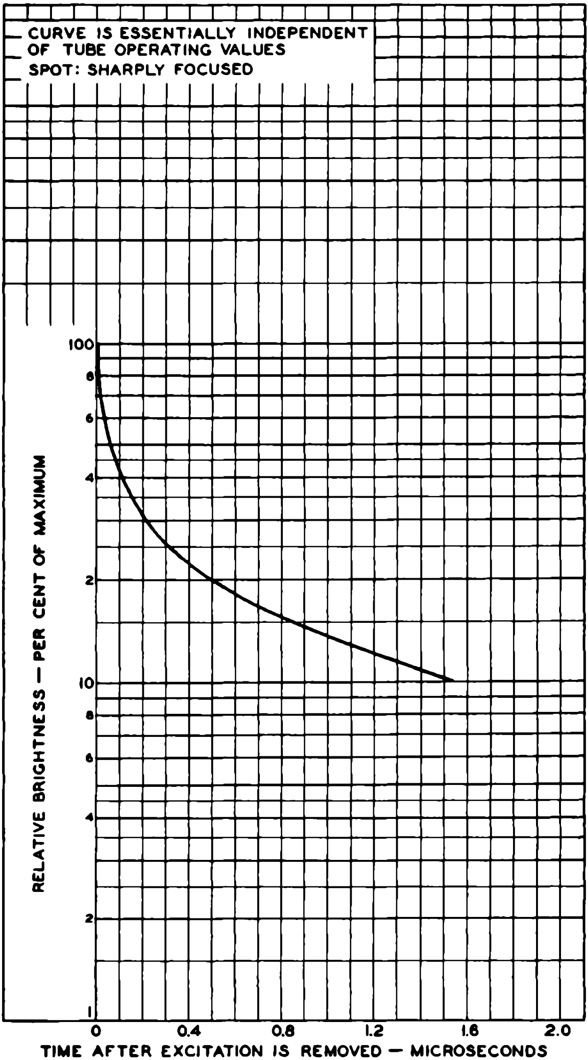


DEC. 18, 1953

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8204

PERSISTENCE CHARACTERISTIC OF PHOSPHOR P24



FEB. 18, 1955

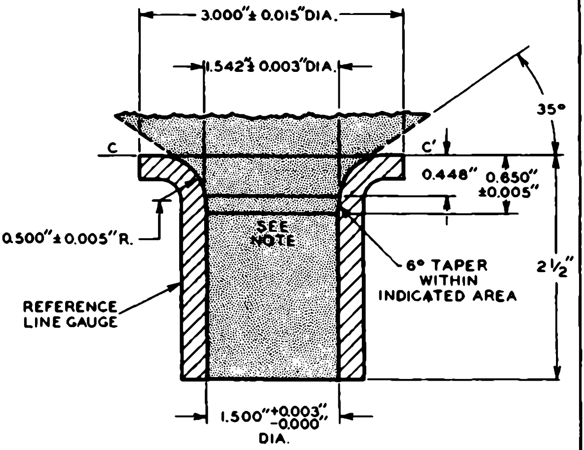
TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8205R1

REFERENCE-LINE GAUGE
JETEC № 110

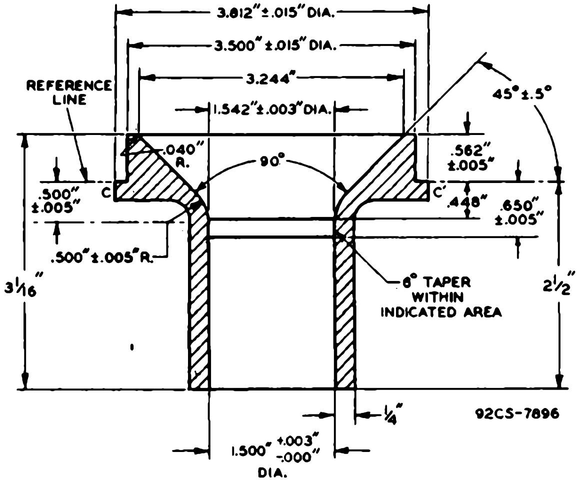
With Supplementary Information on Recommended Inside Contour of Yoke to Provide Proper Location of Yoke on Neck-Funnel Section.



NOTE: INNER SURFACE OF YOKE MUST NOT EXTEND INTO SHADED REGION

92CS-7391

REFERENCE-LINE GAUGE
JETEC № 116



AUG. 1, 1953

CE-7896

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

X-RAY PRECAUTIONS
FOR CATHODE-RAY TUBES

WARNING

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

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

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.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

2AP1-A

2AP1-A

HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 2AP1

General:

Heater, for Unipotential Cathode:

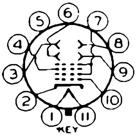
Voltage	6.3 ± 10%	ac or dc volts
Current	0.6	amp.

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°.

RCA VICTOR DIVISION
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

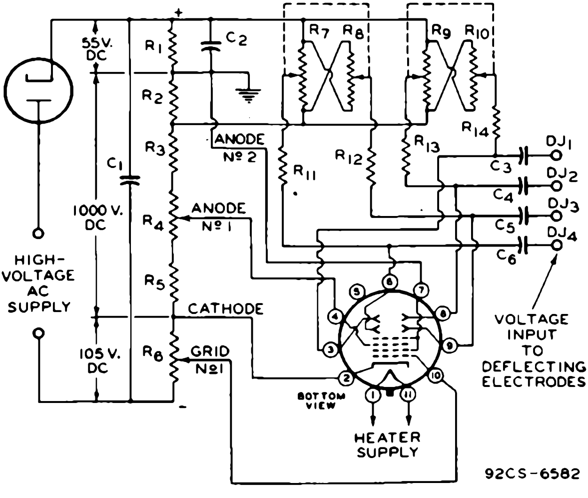
HIGH-VACUUM CATHODE-RAY TUBE

(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



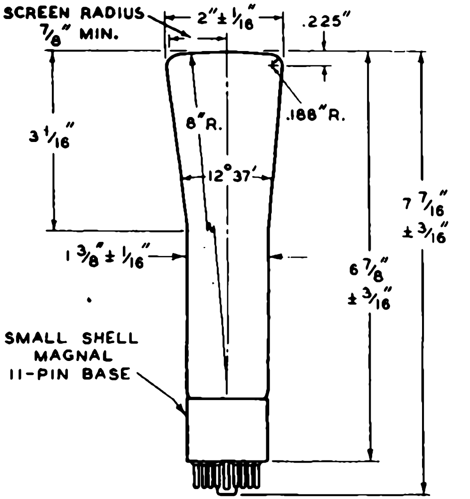
C1: 0.1 μf
C2: 1.0 μf
C3 C4 C5 C6: 0.05-μf Blocking Capacitor*
R1 R2: 0.5 Megohm
R3: 3.0 Megohms
R4: 1.0-Megohm Potentiometer
R5: 0.5 Megohm
R6: 0.5-Megohm Potentiometer
R7 R8: Dual 5-Megohm Potentiometer
R9 R10: Dual 5-Megohm Potentiometer
R11 R12 R13 R14: 2 Megohms

*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.

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

2AP1-A

HIGH-VACUUM CATHODE-RAY TUBE



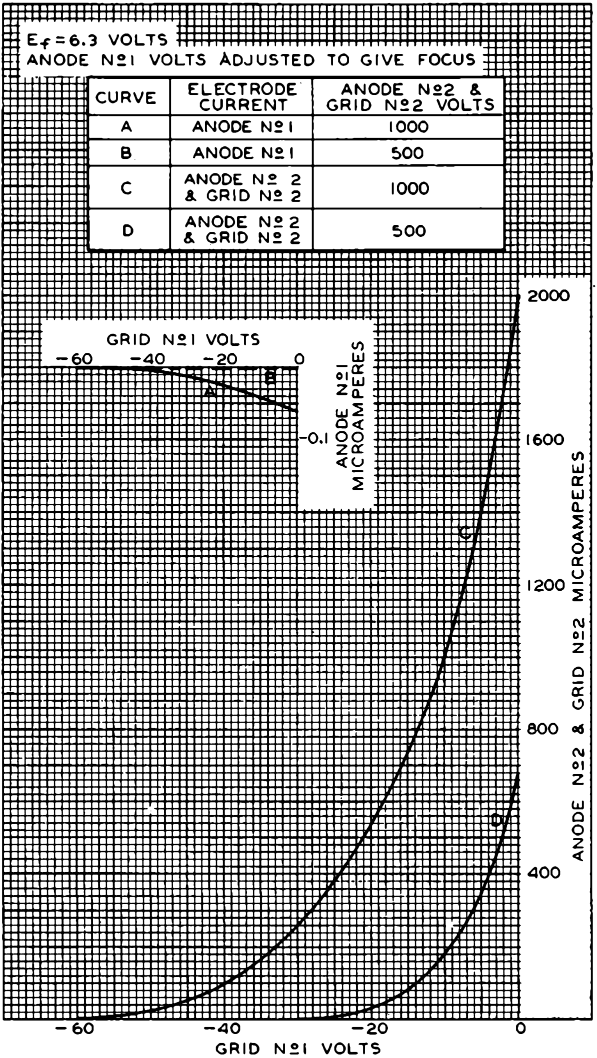
℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

2AP1-A

AVERAGE CHARACTERISTICS



CURVE	ELECTRODE CURRENT	ANODE №2 & GRID №2 VOLTS
A	ANODE №1	1000
B	ANODE №1	500
C	ANODE № 2 & GRID № 2	1000
D	ANODE № 2 & GRID № 2	500

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

2BP1
OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

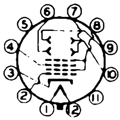
Voltage	6.3	ac or dc volts
Current	0.6	amp

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_{b_2}) 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.

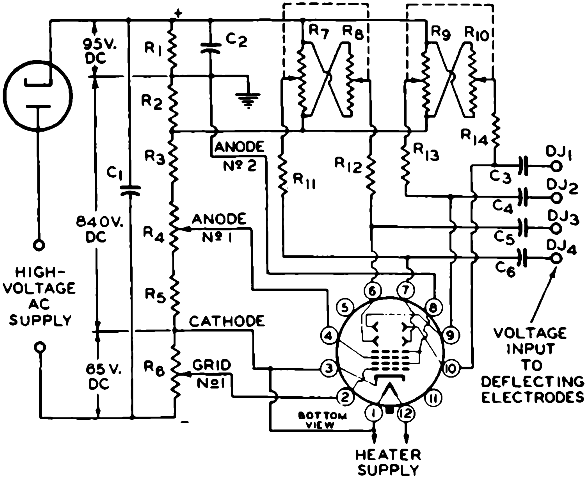
● Anode No.2 and grid No.2 which are connected together within tube, are referred to herein as anode No.2. The product of anode-No.2 voltage and average anode-No.2 current should be limited to 6 watts.

□ 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.

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

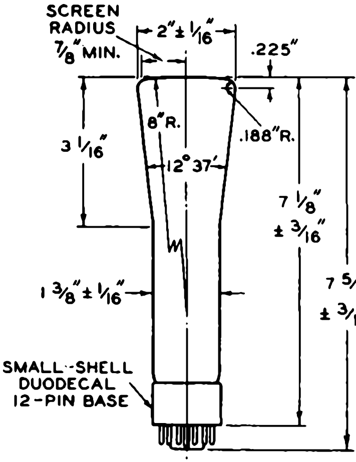
* When cathode is grounded, capacitors should have high voltage rating; when anode No.2 is grounded, they may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode 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

RCA

2BP1

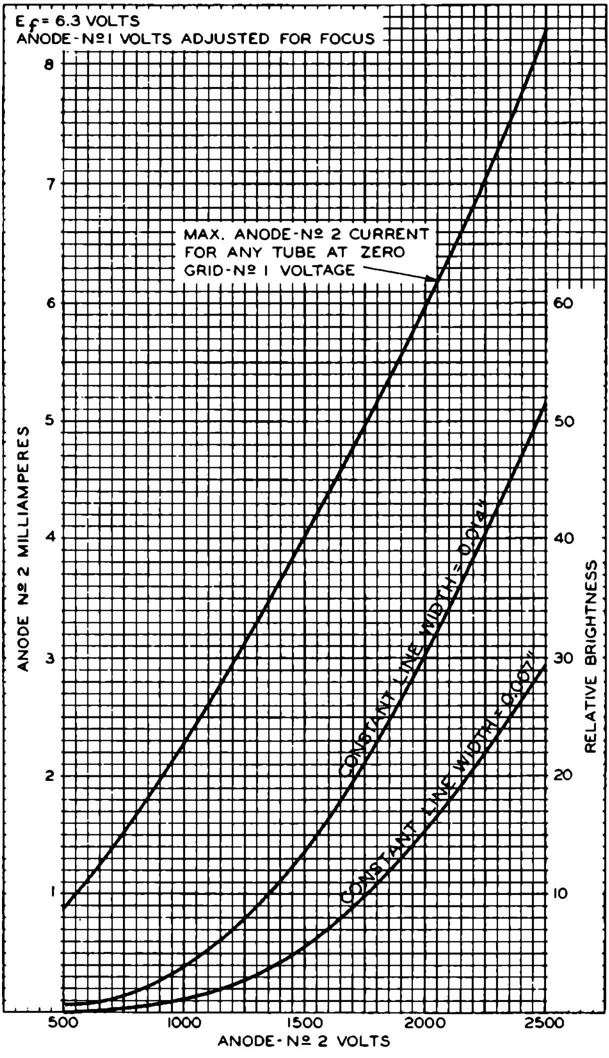
OSCILLOGRAPH TUBE



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

92CS-6689

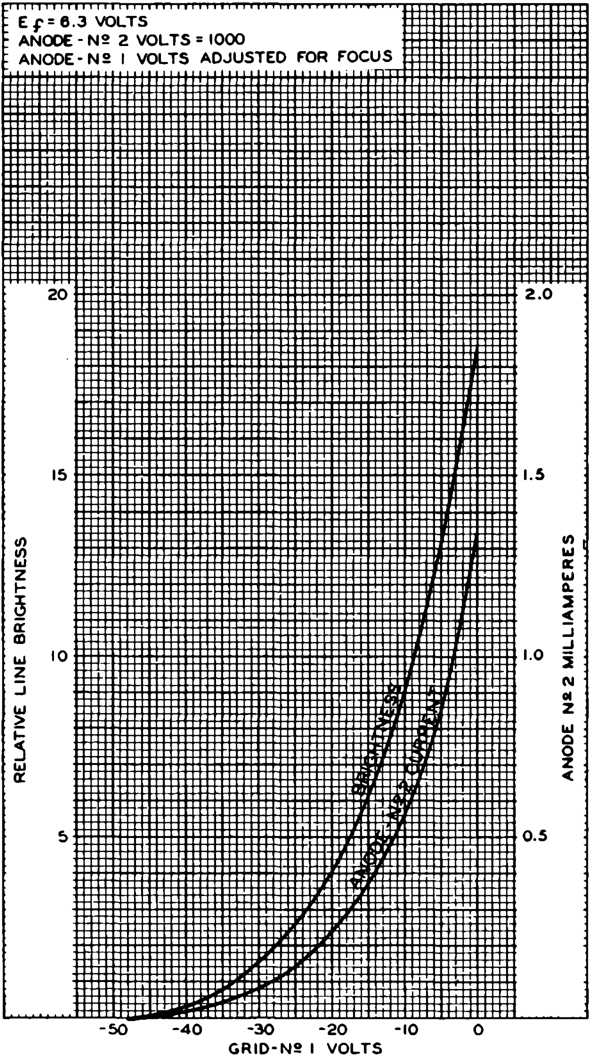
2BP1
CHARACTERISTICS



RCA

2BP1

AVERAGE CHARACTERISTICS



RCA

2BPII

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

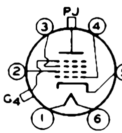
Direct Interelectrode Capacitances:

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

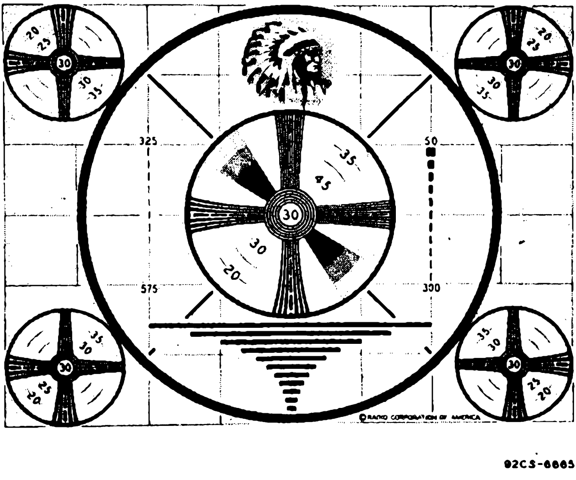
▲ Individual tubes may require between + 20% and - 20% of these values.

† 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.

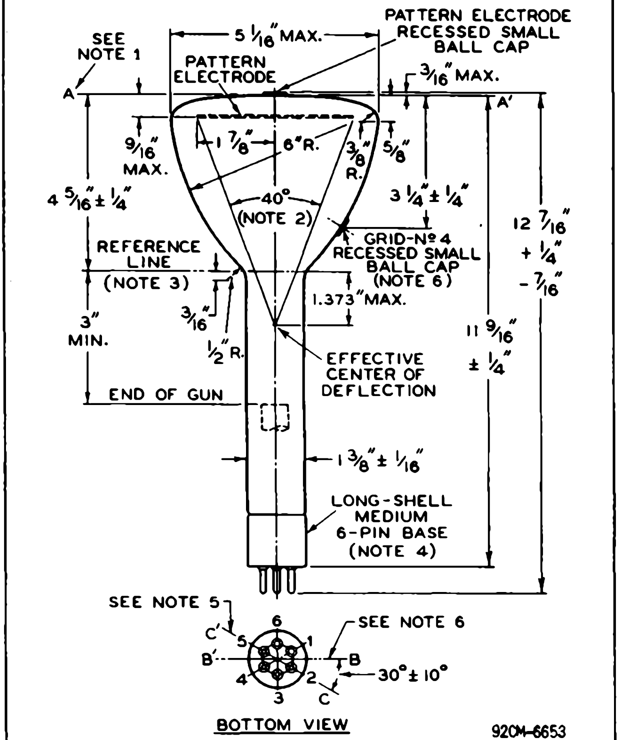
▲▲ With full scanning.

PATTERN



92CS-6665

2F21
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.

RCA

2P23
IMAGE ORTHICON

MAGNETIC FOCUS--MAGNETIC DEFLECTION

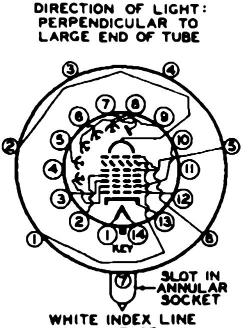
DATA

General:

Heater, for Unipotential Cathode:		
Voltage.	6.3 ± 10%	. . . ac or dc volts
Current.	0.6	. . . . amp
Direct Interelectrode Capacitance:		
Anode to All Other Electrodes	20	. . . . $\mu\mu f$
Photocathode Spectral Response		See Curve ←
Image Size (4 x 3 aspect ratio).		1.6" Diagonal
Focusing Method.		Magnetic
Deflection Method.		Magnetic
Overall Length		15-1/4" ± 1/4"
Greatest Diameter of Bulb.		3" ± 1/16"
Minimum Deflecting-Coil Inside Diameter.		2-1/8"
Deflecting-Coil Length		5" ←
Focusing-Coil Length		10" ←
Alignment-Coil Length.		15/16" ←
Photocathode Distance Inside End of Focusing Coil. . . .		1/2" ←
Operating Position		Any except with diheptal base up and tube axis at angle of less than 20° from the vertical
End Base		Small-Shell Diheptal 14-Pin

Pin 1 - Heater
Pin 2 - Grid No.4
Pin 3 - Grid No.3
Pin 4 - Internal Connection—Do Not Use
Pin 5 - Dynode No.2
Pin 6 - Dynode No.4
Pin 7 - Anode
Pin 8 - Dynode No.5
Pin 9 - Dynode No.3
Pin 10 - Dynode No.1, Grid No.2
Pin 11 - Internal Connection--Do Not Use
Pin 12 - Grid No.1
Pin 13 - Cathode
Pin 14 - Heater

BOTTOM VIEW



Shoulder Base. . . . . Jumbo Annular 7-Pin

Pin 1 - Grid No.6
Pin 2 - Photocathode
Pin 3 - Internal Connection—Do Not Use
Pin 4 - Internal Connection--Do Not Use
Pin 5 - Grid No.5
Pin 6 - Target
Pin 7 - Internal Connection—Do Not Use

← Indicates a change.

2P23

2P23
IMAGE ORTHICON

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

PHOTOCATHODE VOLTAGE	-550 max.	volts
PHOTOCATHODE ILLUMINATION.	50 max.	ft-c
OPERATING TEMPERATURE OF ANY PART OF BULB.	65 max.	°C
OPERATING TEMPERATURE OF BULB AT LARGE END OF TUBE (Target Section) . . .	35 min.	°C
TEMPERATURE DIFFERENCE BETWEEN TARGET SECTION AND ANY PART OF BULB HOTTER THAN TARGET SECTION.	5 max.	°C
GRID-No.6 VOLTAGE.	-550 max.	volts
TARGET VOLTAGE:		
Positive value	50 max.	volts
Negative value	50 max.	volts
GRID-No.5 VOLTAGE	150 max.	volts
GRID-No.4 VOLTAGE	300 max.	volts
GRID-No.3 VOLTAGE	400 max.	volts
GRID-No.2 & DYNODE-No.1 VOLTAGE.	350 max.	volts
GRID-No.1 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	10 max.	volts
ANODE-SUPPLY VOLTAGE●	1650 max.	volts
VOLTAGE PER MULTIPLIER STAGE	350 max.	volts

→**Typical Operation:**

Photocathode Voltage (Image Focus) . .	-300 to -500	volts
Grid-No.6 Voltage (Accelerator)— 80% of photocathode voltage*	-240 to -400	volts
Target Voltage●.	0	volts
Grid-No.5 Voltage (Decelerator)●● . .	0 to 100	volts
Grid-No.4 Voltage (Beam Focus)	160 to 240	volts
Grid-No.3 Voltage#	225 to 330	volts
Grid-No.2 & Dynode-No.1 Voltage. . . .	300	volts
Grid-No.1 Voltage (For Picture Cutoff)	-15 to -85	volts
Dynode-No.2 Voltage.	600	volts
Dynode-No.3 Voltage.	880	volts
Dynode-No.4 Voltage.	1160	volts
Dynode-No.5 Voltage.	1450	volts
Anode Voltage.	1500	volts
Anode Current.	50	μamp
Target Temperature Range	35 to 60	°C
Ratio of Peak-to-Peak Highlight Video-Signal Current to RMS Noise Current (Approx.). . . .	35	
Minimum Peak-to-Peak Blanking Voltage	10	volts
Field Strength at Center of Focusing Coil	75	gausses

●,*,●,●●,#: See next page.

→Indicates a change.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

2P23
IMAGE ORTHICON

Focusing-Coil Current (Approx.) for coil listed below)	75	ma
Deflecting-Coil Current (Approx. for assembly listed below):		
Horizontal (Peak to Peak).	625	ma
Vertical (Peak to Peak).	290	ma
Alignment-Coil Current (Approx. for coil listed below)	0 to 30	ma

Components: ←

Deflecting-Coil Assembly (Includes Keyed Jumbo Annular 7-Pin Socket). .	RCA Type No. 201D75
Focusing-Coil Assembly	RCA Type No. 202D75
Alignment-Coil Assembly.	RCA Type No. 204D75
Hor. Deflection Output Transformer . .	RCA Type No. 204T1
Ver. Deflection Output Transformer . .	RCA Type No. 204T2

● Ratio of dynode voltages is shown under Typical Operation.

* For best operation, this voltage should be adjustable within ± 25% of indicated value. For simplified equipment, this voltage can be fixed.

● Adjustable within ± 3 volts of indicated value, with blanking voltage off.

●● Taps at 0, 30, 60, and 90 volts are recommended. Set at voltage giving most uniform resolution and signal output over entire picture area. ←

Adjust to give the most uniformly shaded picture near maximum signal.

OPERATING NOTES

After the 2P23 has been inserted in its sockets and the voltages applied, allow it to warm up for 1/2 to 1 hour with the camera lens iris closed. Then, proceed with normal operating adjustments.

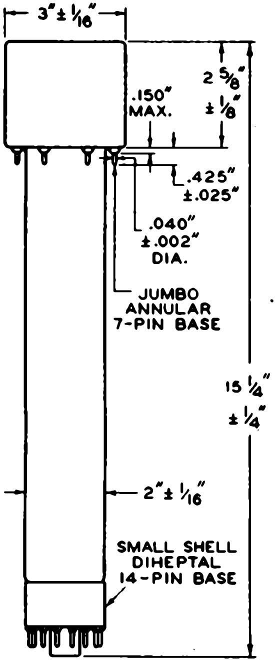
When the equipment design or operating conditions are such that the maximum temperature rating or maximum temperature difference will be exceeded, provision should be made to direct a blast of cooling air from the diheptal-base end of the tube along the entire length of the bulb surface, i.e., through the space between the bulb surface and the surrounding deflecting coil and its extension. For this purpose, a small blower is satisfactory, but it should run at low speed to prevent vibration of the 2P23 and the associated amplifier equipment. Unless vibration is prevented, distortion of the picture may occur. To keep the operating temperature of the large end of the tube from falling below 45°C, some form of controlled heating should be employed. Ordinarily, adequate heat will be supplied by the focusing coil, deflection coils, and associated amplifier tubes so that the temperature can be controlled by the amount of cooling air directed along the bulb surface.

Resolution of better than 400 lines at the center of the picture can be produced by the 2P23 when the highlight illumination is above the knee of the typical signal-output curve for this type. To utilize such resolution capability in the horizontal direction with the standard scanning rate of 525 lines, it is necessary to use a video amplifier having a bandwidth of at least 5.5 megacycles. The maximum resolution obtainable is limited by the mesh-screen portion of the target.

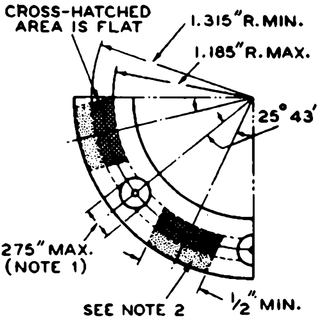
← Indicates a change.

2P23

2P23
IMAGE ORTHICON



DETAIL OF BOTTOM VIEW OF JUMBO ANNULAR BASE



NOTE 1: MEASURED AT DISTANCE OF 1/32" BELOW BOTTOM OF ANNULAR BASE.

NOTE 2: DOTTED AREA IS FLAT OR EXTENDS TOWARD DIHEPTAL-BASE END OF TUBE BY 0.060" MAX.

ANNULAR BASE GAUGE

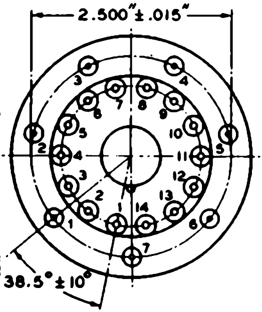
ANGULAR VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF NECK CYLINDER WITH RESPECT TO PHOTOCATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND NECK CYLINDER WILL FIT FLAT-PLATE GAUGE WITH:

a. SEVEN HOLES HAVING DIAMETER OF 0.065" ± 0.001" AND DEPTH OF 0.265" ± 0.001". HOLES ARE ENLARGED BY 45° TAPER TO DEPTH OF 0.047" AND ARE SPACED AT ANGLES OF 51°26' ± 5' ON CIRCLE DIAMETER OF 2.500" ± 0.001".

b. SIX STOPS HAVING HEIGHT OF 0.187" ± 0.001", CENTERED BETWEEN PIN HOLES, TO BEAR AGAINST FLAT AREAS OF BASE.

c. RIM EXTENDING OUT A MINIMUM OF 1/8" FROM 2-13/16" DIAMETER AND HAVING HEIGHT OF 0.126" ± 0.001".

d. NECK-CYLINDER CLEARANCE HOLE HAVING DIAMETER OF 2.200" ± 0.001".



ENLARGED BOTTOM VIEW

92CM-6685

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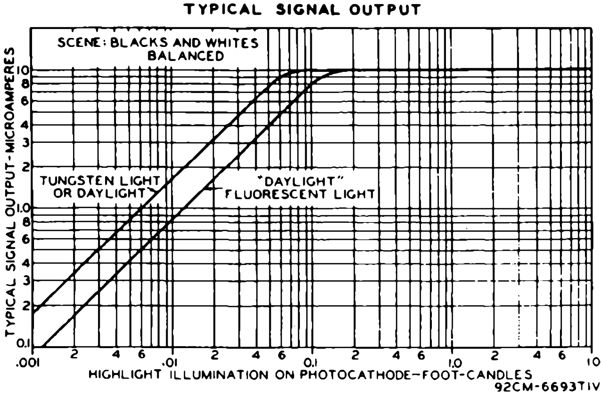
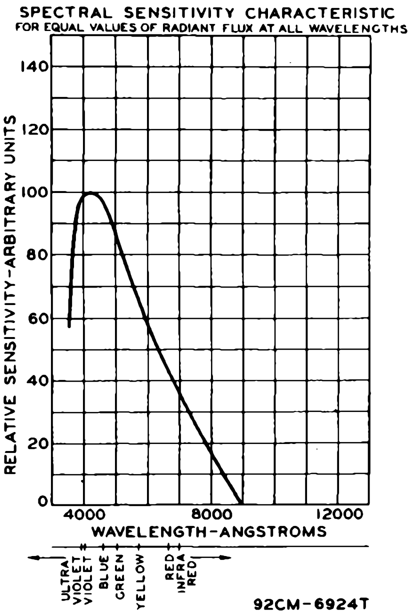
2P23

2P23

CHARACTERISTIC CURVES



92CM-6693T1V



92CM-6924T

MAR. 15, 1948

CE-6693T1V-6924T

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

3API-A
OSCILLOGRAPH TUBE

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

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

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.

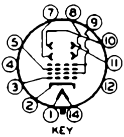
Direct Interelectrode Capacitances (Approx.):

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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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

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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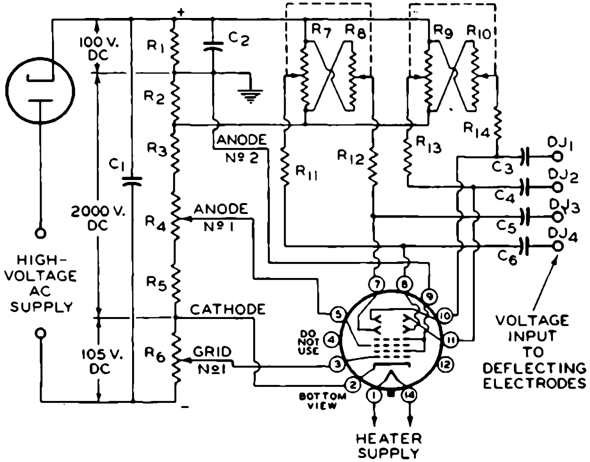
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

3BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



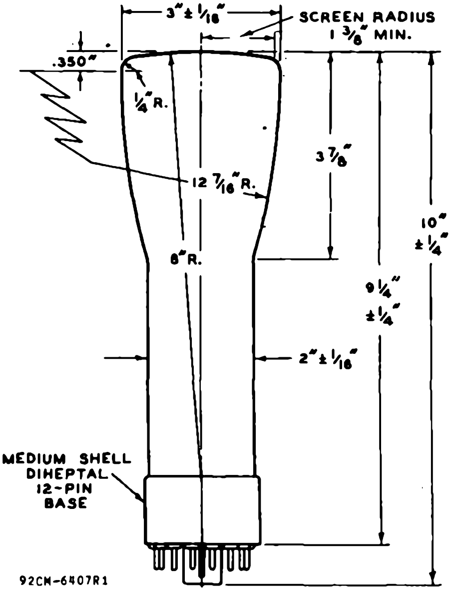
92CS-6514

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

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

3BP1-A

HIGH-VACUUM CATHODE-RAY TUBE



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

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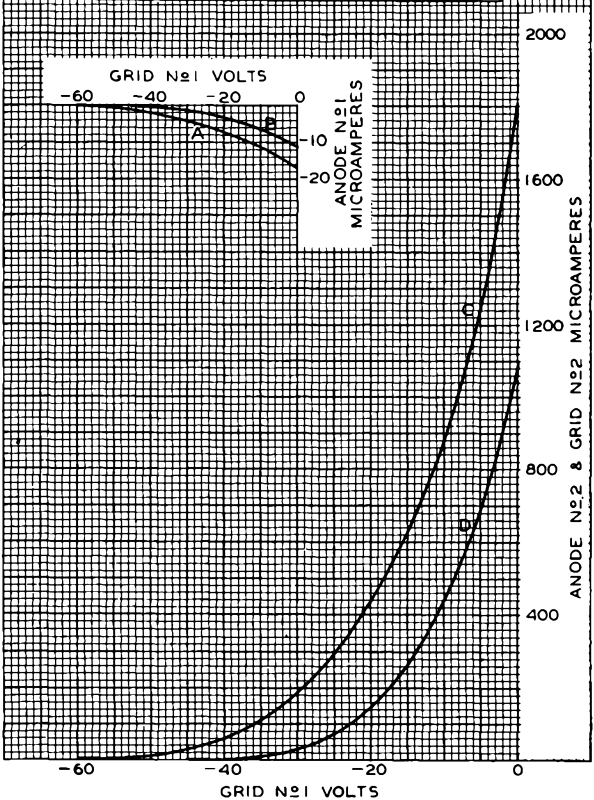
RCA

3BP1-A

AVERAGE CHARACTERISTICS

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

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



3JP7
OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS   ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

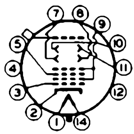
Voltage	6.3	ac or dc volts
Current	0.6	amp

Direct Interelectrode Capacitances (Approx.): ←

Grid No.1 to All Other Electrodes	8	μμf
Cathode to All Other Electrodes	8	μμf
DJ_1 to DJ_2	2.5	μμf
DJ_3 to DJ_4	2	μμf
DJ_1 to All Other Electrodes	8	μμf
DJ_2 to All Other Electrodes	7	μμf
DJ_3 to All Other Electrodes	7	μμf
DJ_4 to All Other Electrodes	8	μμf

Phosphor (For Curves, see front of this Section)	No.7
Fluorescence	Blue ←
Phosphorescence	Greenish-Yellow ←
Persistence	Long
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
Base	Medium-Shell Diheptal 12-Pin
Basing Designation for BOTTOM VIEW	$14J_1$

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



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

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

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

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

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

← Indicates a change.

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3JP7

3JP7
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 (CONTROL ELECTRODE) 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
Max. Grid-No.1 Voltage for Visual Cutoff . .	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	

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 Voltage . .	400-690	300-515	400-690	. .volts
Max. Grid-No.1 Voltage for Visual Cutoff.	-90	-67.5	-90	. .volts
Deflection Factors:				
DJ_1 & DJ_2	136-184	127-173	170-230	v dc/in.
DJ_3 & DJ_4	100-136	94-128	125-170	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

■,●,*,**,○: See next page.

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3JP7

3JP7
OSCILLOGRAPH TUBE

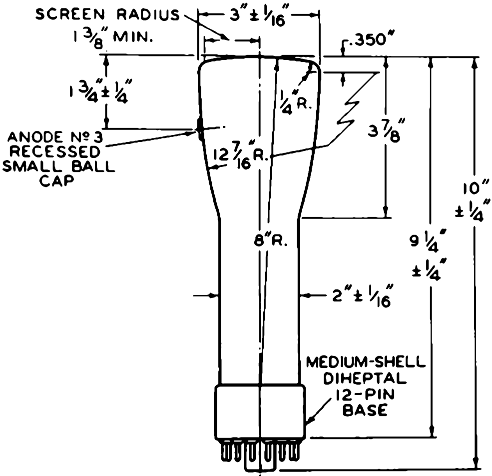
■ Anode No. 2 and grid No. 2, which are connected together within tube, are referred to herein as anode No. 2.

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

* 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.

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



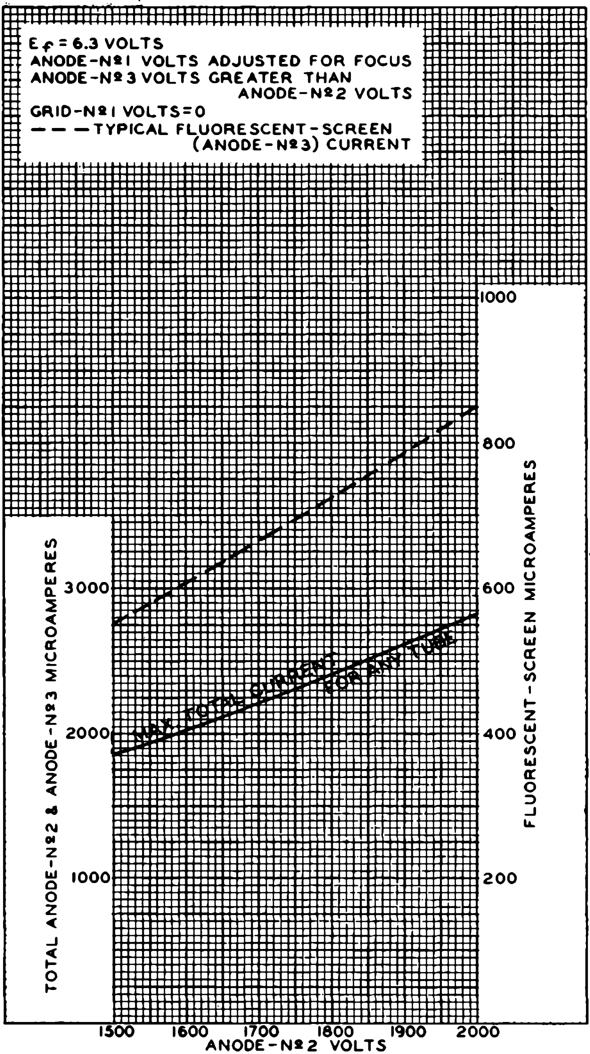
℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF BASE.

92CM-6583

RCA

3JP7

CHARACTERISTICS



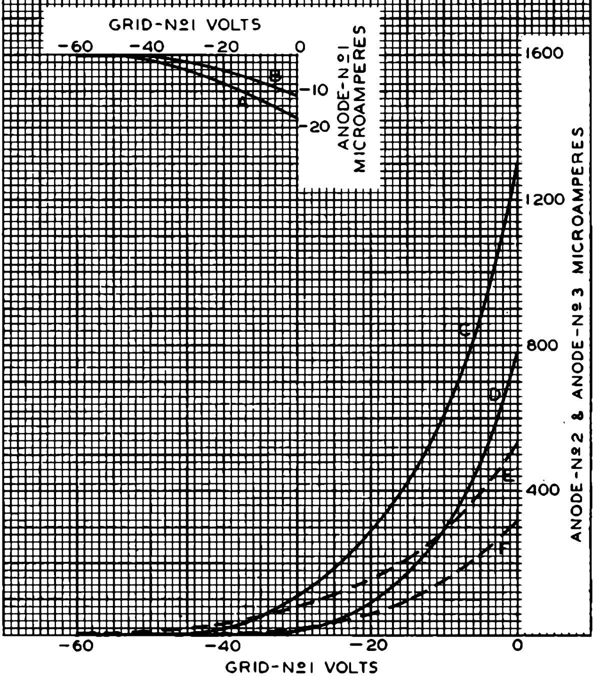
3JP7

3JP7

AVERAGE CHARACTERISTICS

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

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



APR. 24, 1945

TUBE DEPARTMENT
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92CM-6421R1

3KP1

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

DATA

General:

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

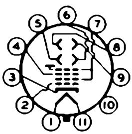
Direct Interelectrode Capacitances (Approx.):

Grid No.1 to all other electrodes	8	μμf
Deflecting electrode DJ_1 to deflecting electrode DJ_2	2.5	μμf
Deflecting electrode DJ_3 to deflecting electrode DJ_4	2.5	μμf
DJ_1 to all other electrodes	11	μμf
DJ_2 to all other electrodes	8	μμf
DJ_3 to all other electrodes	7	μμf
DJ_4 to all other electrodes	8	μμf

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

Focusing Method . . . . Electrostatic
Deflection Method . . . . Electrostatic
Overall Length. . . . . 11-1/2" ± 1/4"
Greatest Diameter of Bulb . . . . 3" ± 1/16"
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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3KPI

3KPI
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 $\pm 10^\circ$ (measured about the tube axis).

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

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

ULTOR 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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RCA

3KP1

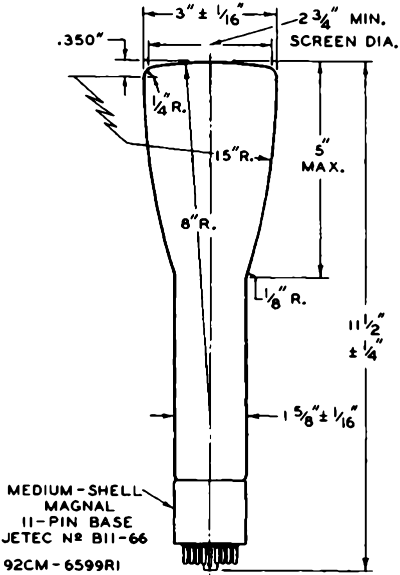
OSCILLOGRAPH TUBE

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

Maximum Circuit Values:

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

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



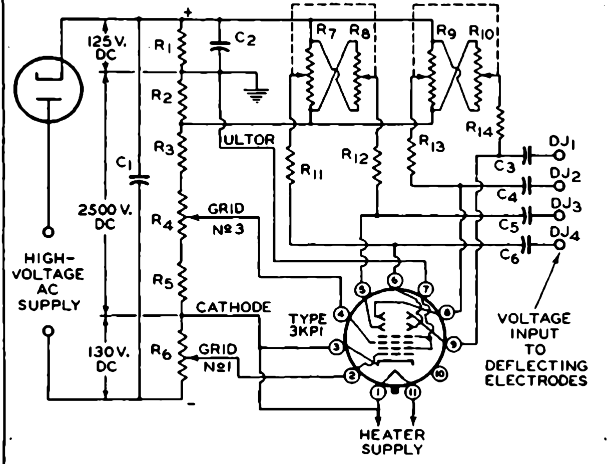
℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

← Indicates a change.

RCA

3KP1
OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



92CS-6690R2

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

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

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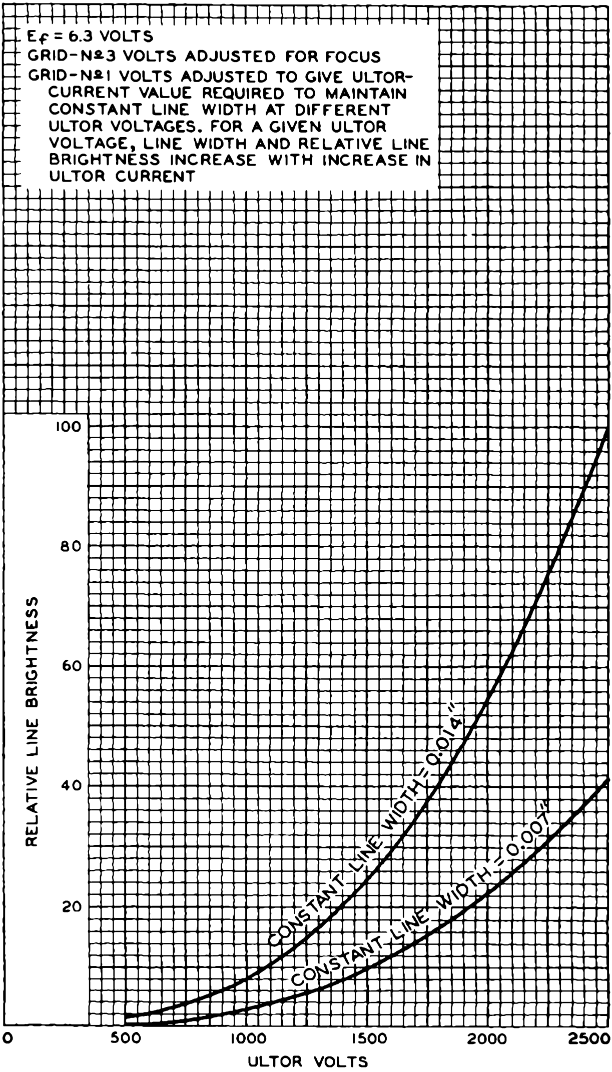
3KP1

CHARACTERISTICS



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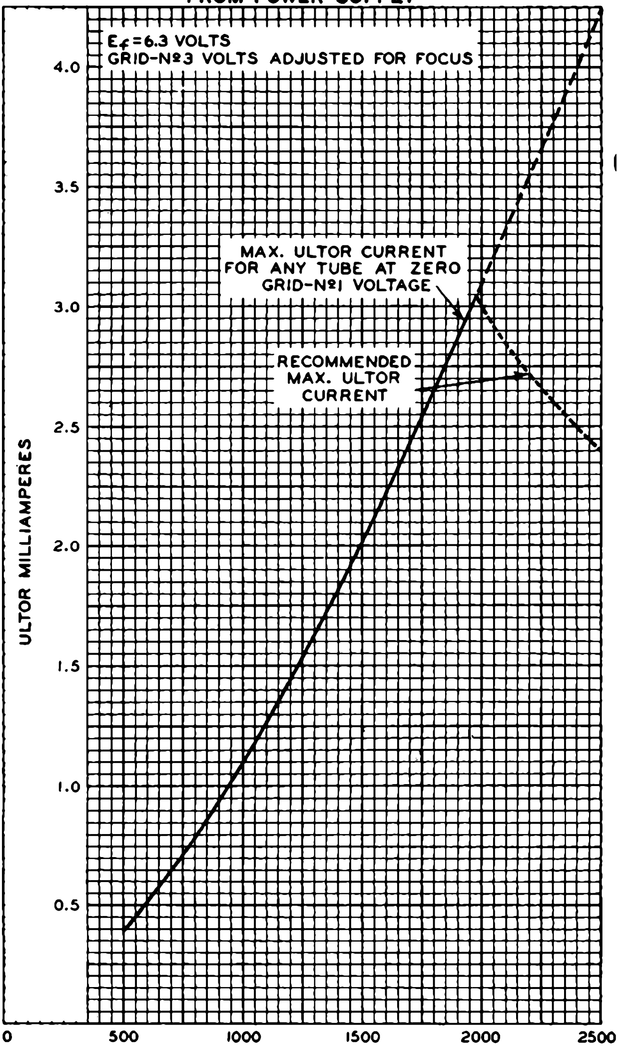
92CM-7191R2

3KP1

RCA

3KP1

MAXIMUM ULTOR-CURRENT REQUIREMENTS FROM POWER SUPPLY



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92CM-7192R1

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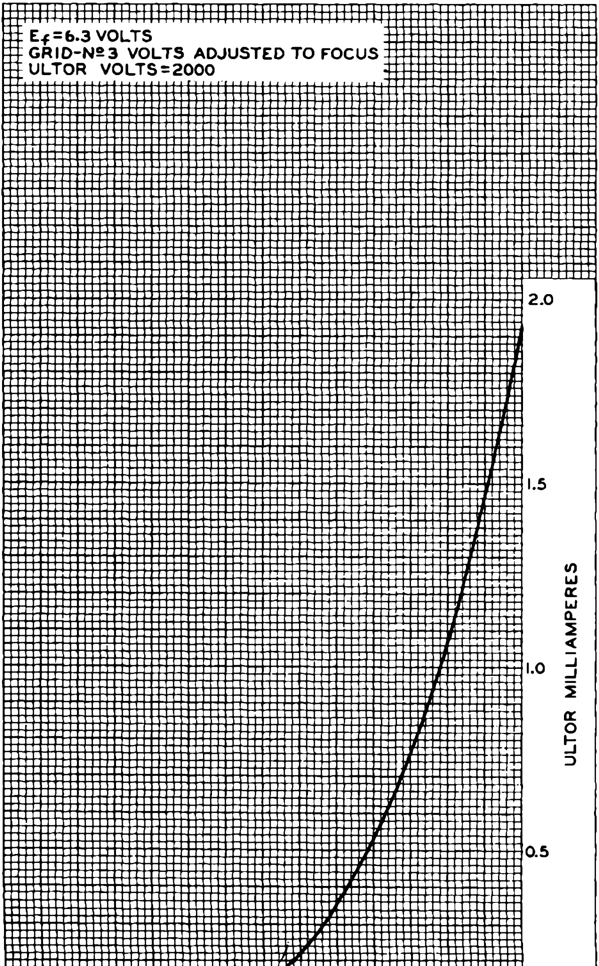
3KP1

AVERAGE CHARACTERISTIC



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92CM-6658R2

RCA

3KP4

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

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

General:

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

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

RCA

3MP1

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

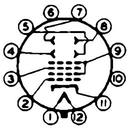
DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6	amp
Direct Interelectrode Capacitances (Approx.):		
Cathode to All Other Electrodes	2.2	
Grid No.1 to All Other Electrodes	10.3	μμf
DJ_1 to DJ_2	1.3	μμf
DJ_3 to DJ_4	1.2	μμf
DJ_1 to All Other Electrodes Except DJ_2	4.4	μμf
DJ_2 to All Other Electrodes Except DJ_1	5.6	μμf
DJ_3 to All Other Electrodes Except DJ_4	5.0	μμf
DJ_4 to All Other Electrodes Except DJ_3	4.5	μμf

Phosphor (For Curves, see front of this Section) No.1
Fluorescence . . . . Green
Persistence. . . . . Medium
Focusing Method. . . . . Electrostatic
Deflection Method. . . . . Electrostatic
Overall Length . . . . 8" ± 1/4"
Greatest Diameter of Bulb. . . . . 3" ± 1/16"
Minimum Useful Screen Diameter . . . . 2-3/4"
Mounting Position. Any
Base . . . . Small-Shell Duodecal 12-Pin
Basing Designation for Bottom View 12F

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



Pin 7 - Deflecting Electrode DJ_1
Pin 8 - Deflecting Electrode DJ_2
Pin 9 - Anode No.2, Grid No.2
Pin 10 - No Connection
Pin 11 - Cathode
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 plane through the tube axis and pin 4 may vary from the trace produced by DJ_1 and DJ_2 by an angular tolerance (measured about the tube axis) of 10°.

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

ANODE-No.2• VOLTAGE# . . . . 2500 max. volts

• 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.

3MP1

3MP1

OSCILLOGRAPH TUBE

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 (Eb_2) between recommended minimum and 2500 volts*

Anode-No.1 Voltage . . .	20% to 35% of Eb_2	volts
Max. Grid-No.1 Voltage for Visual Cutoff .	6.3% of Eb_2	volts
Anode-No.1 Cur. for any Operating Condition. .	-15 to +10 . .	microamperes
Deflection Factors:		
DJ_1 & DJ_2	115 to 145	v dc/in./kv of Eb_2
DJ_3 & DJ_4	110 to 140	v dc/in./kv of Eb_2

Examples of Use of Design Ranges:

For anode-No.2 voltage of	*1000*	*2000*	*volts*
Anode-No.1 Voltage . . .	200-350	400-700	volts
Max. Grid-No.1 Voltage for Visual Cutoff .	-63	-126	volts
Deflection Factors:			
DJ_1 & DJ_2	115-145	230-290	volts dc/in.
DJ_3 & DJ_4	110-140	220-280	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

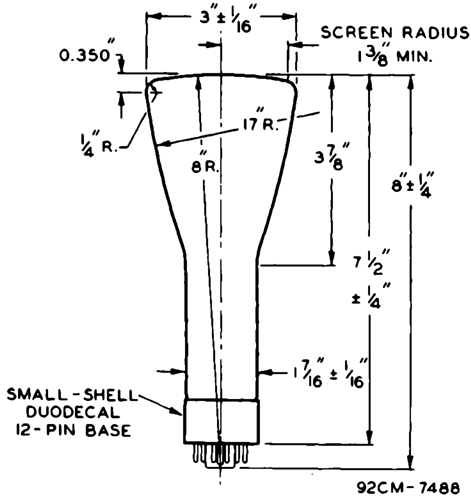
* Brilliance and definition decrease with decreasing anode-No.2 voltage. Recommended minimum for the 3MP1 in general service is 1000 volts but a value as low as 500 volts may be used under conditions of low-velocity deflection and low ambient-light levels.

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

RCA

3MP1

OSCILLOGRAPH TUBE



RCA

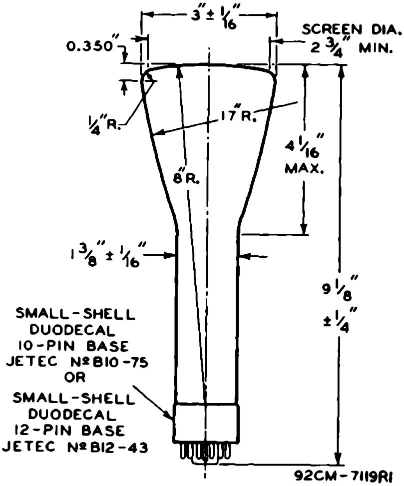
3RP1
OSCILLOGRAPH TUBE

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.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

3RP1-A

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

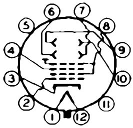
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp

Direct Interelectrode Capacitances (Approx.):

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

Faceplate	Flat Clear Glass
Phosphor (For Curves, see front of this Section)	P1
Fluorescence	Green
Phosphorescence	Green
Persistence	Medium
Focusing Method	Electrostatic
Deflection Method	Electrostatic
Overall Length	9-1/8" ± 1/4"
Greatest Diameter of Bulb	3" ± 1/16"
Minimum Useful Screen Diameter	2-3/4"
Mounting Position	Any
Weight (Approx.)	12 oz
Bulb	J-24S1
Base	Small-Shell Duodecal 10-Pin (JETEC No.B10-75), or Small-Shell Duodecal 12-Pin (JETEC No.B12-43)
Basing Designation for BOTTOM VIEW	12E

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



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

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

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

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3RP1-A

OSCILLOGRAPH TUBE

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

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

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

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

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

Equipment Design Ranges:

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

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

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

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

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

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3RP1-A

OSCILLOGRAPH TUBE

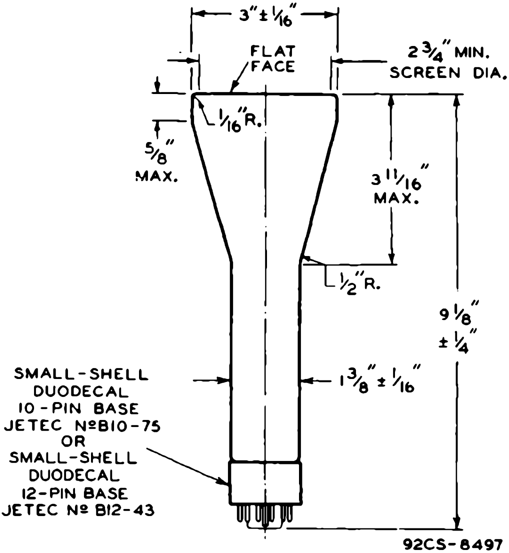
Examples of Use of Design Ranges:

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.

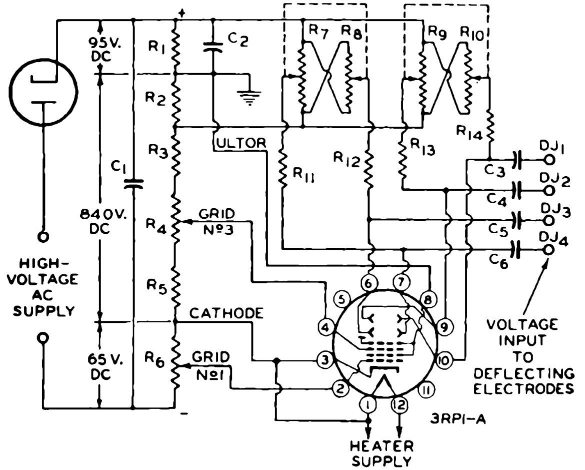


CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

3RP1-A

3RP1-A
OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



92CS-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.

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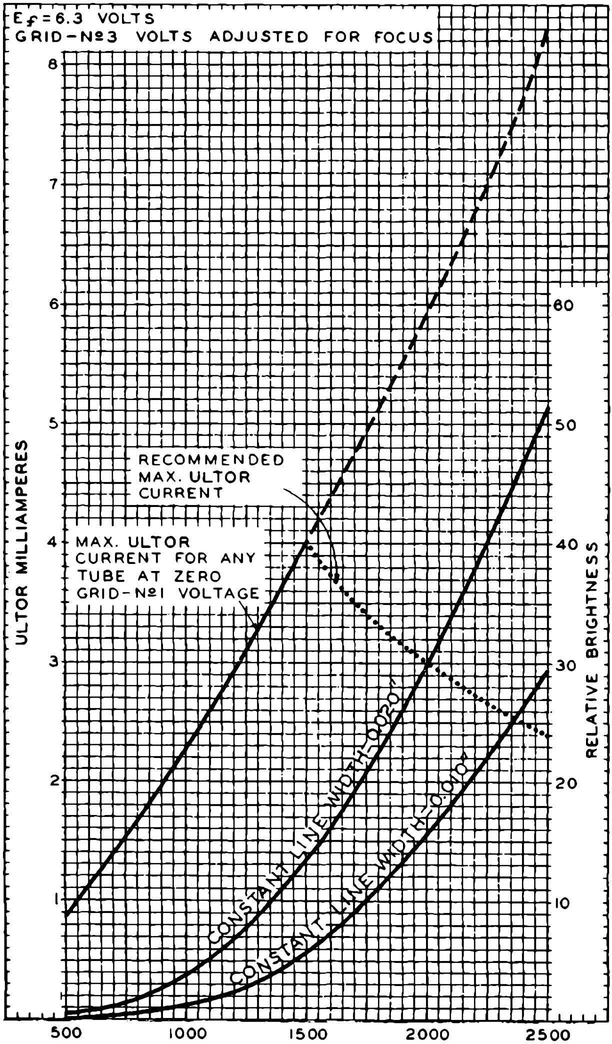
3RP1-A CHARACTERISTICS



3RPI-A

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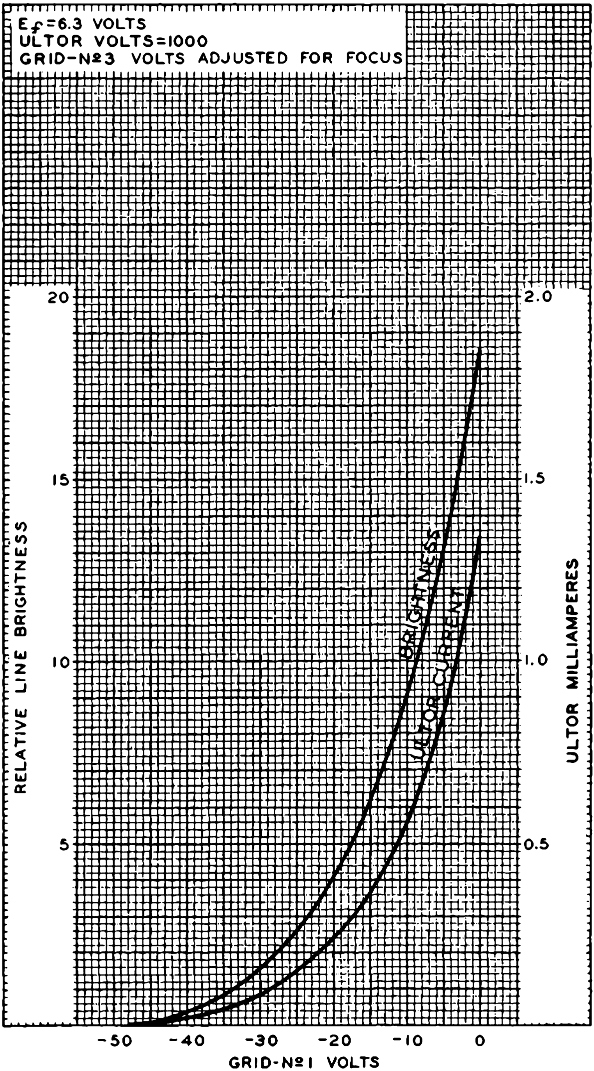
3RPI-A

AVERAGE CHARACTERISTICS



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92CM-7141R1

3RP4

3RP4

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

The 3RP4 is the same as the 3RP1 except for the following items:

General:

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

In general, operation of the 3RP4 at an ultor voltage less than 1500 volts is not recommended.

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OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS — ELECTROSTATIC DEFLECTION

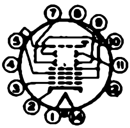
DATA

General:

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

BOTTOM VIEW

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



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

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

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

The plane through the tube axis and each of the following items may vary from the trace produced by DJ_1 and DJ_2 by

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OSCILLOGRAPH TUBE

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

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

POST-ULTOR● VOLTAGE	6000 max.	volts
ULTOR▲ VOLTAGE	2600 max.	volts
RATIO OF POST-ULTOR VOLTAGE TO ULTOR VOLTAGE	2.3:1 max.	
GRID-No.3 VOLTAGE	1000 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	200 max.	volts
Positive bias value○	0 max.	volts
Positive peak value	2 max.	volts
PEAK VOLTAGE BETWEEN ULTOR AND ANY DEFLECTING ELECTRODE	500 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

Equipment Design Ranges:

For any post-ultor voltage (E_{c_5}) between 2000 and 6000 volts and any ultor voltage (E_{c_4}) between 1500** and 2600 volts*

Grid-No.3 Voltage for Focus	20% to 34.5% of E_{c_4}	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	2.6% to 4.3% of E_{c_4}	volts
Grid-No.3 Current for Any Operating Condition	−15 to +10	μamp
Deflection Factors:#		
When $E_{c_5} = 2 \times E_{c_4}$		
DJ_1 & DJ_2	26.5 to 36	v dc/in./kv of E_{c_4}
DJ_3 & DJ_4	18 to 24	v dc/in./kv of E_{c_4}
When $E_{c_5} = E_{c_4}$		
DJ_1 & DJ_2	21.5 to 29	v dc/in./kv of E_{c_4}
DJ_3 & DJ_4	14.5 to 19.5	v dc/in./kv of E_{c_4}
Spot Position	##	

Examples of Use of Design Ranges:

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

●,▲,○,*,**,#,##,□: See next page.

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OSCILLOGRAPH TUBE

Deflection Factors:#

DJ_1 & DJ_2	43 to 58	40 to 54	53 to 72	v dc/in.
DJ_3 & DJ_4	29 to 39	27 to 36	36 to 48	v dc/in.

Maximum Circuit Values:

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

● The "post-ultor" in a cathode-ray tube is the electrode to which is applied a dc voltage higher than the ultor voltage for accelerating the electrons in the beam after its deflection. In the 5AB-types, the post-deflection acceleration function and the collector function are both performed by grid No.5 which is conveniently referred to as "post-ultor".

▲ The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 5AB-types, the ultor function is performed by grid No.4. Since grid No.4 and grid No.2 are connected together within the 5AB-types, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

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

* It is recommended that the post-ultor voltage be not less than 3000 volts for high-speed scanning.

** Recommended minimum value of ultor voltage.

The deflecting electrodes DJ_3 and DJ_4 are designed to have extra-high deflection sensitivity and consequently produce less than full-screen deflection. With post-deflection acceleration, the length of deflection may be limited to 4 inches; without post-deflection acceleration, deflection to full screen diameter will ordinarily be obtained. These electrodes are, therefore, more suitable for the signal voltage than for the time-base voltage.

With heater voltage of 6.3 volts, post-ultor voltage of 4000 volts, ultor voltage of 2000 volts, grid-No.3 voltage adjusted to give focus, grid-No.1 voltage adjusted to give spot that is just visible, each deflecting electrode connected through a 1-megohm resistor to ultor, and tube shielded from all extraneous fields, the center of the undeflected, focused spot will fall within a circle having a 12.5-mm radius concentric with the center of the tube face.

□ For visual cutoff of undeflected focused spot.

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

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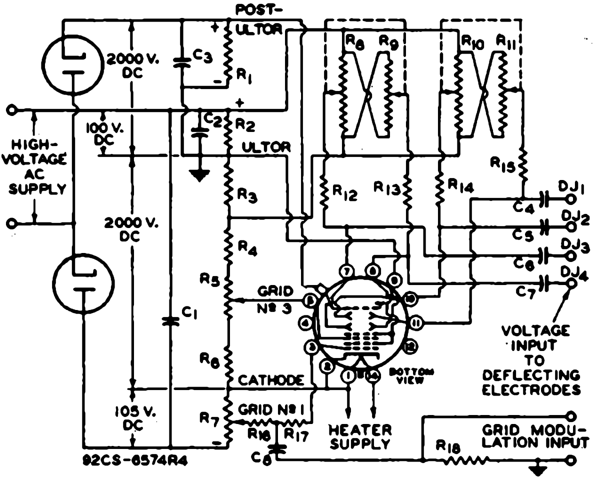
5ABP1

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.1 μf, 2500 Volts
C2: 1.0 μf, 200 Volts
C3: 0.1 μf, 2500 Volts
C4 C5 C6 C7: 0.05-μf, Blocking capacitors*
C8: 0.0001 μf, 2500 Volts
R1: 50 Megohms (Five 10-Megohm, 1-Watt Resistors in Series)
R2 R3: 2 Megohms, 0.5 Watt
R4: 5.5 Megohms, 2 Watts
R5: 2-Megohm Potentiometer
R6: 1.5 Megohms, 0.5 Watt
R7: 0.5-Megohm Potentiometer
R8 R9: 5-Megohm Potentiometer
R10 R11: Dual 5-Megohm Potentiometer
R12 R13 R14 R15: 2 Megohms, 0.5 Watt
R16: 0.5 Megohm, 0.5 Watt
R17: Not less than 2000 ohms per volt of positive signal
R18: 5 Megohms, 0.5 Watt

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

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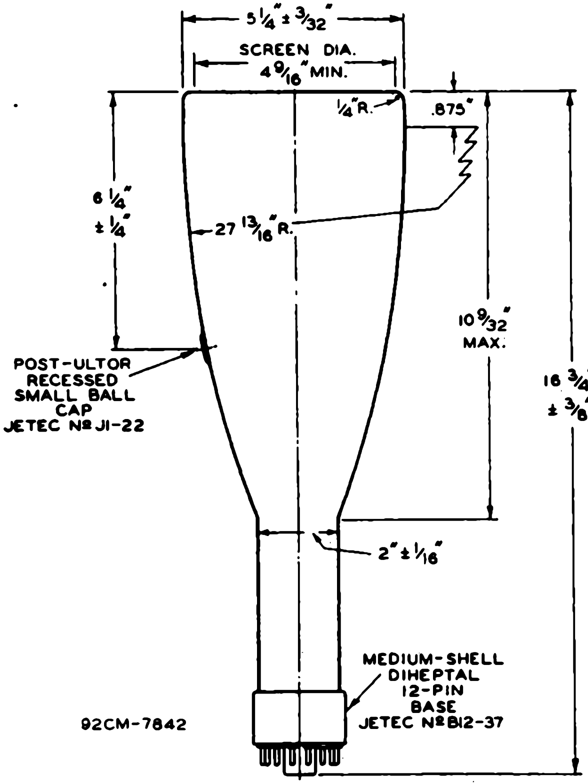
OSCILLOGRAPH TUBE



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

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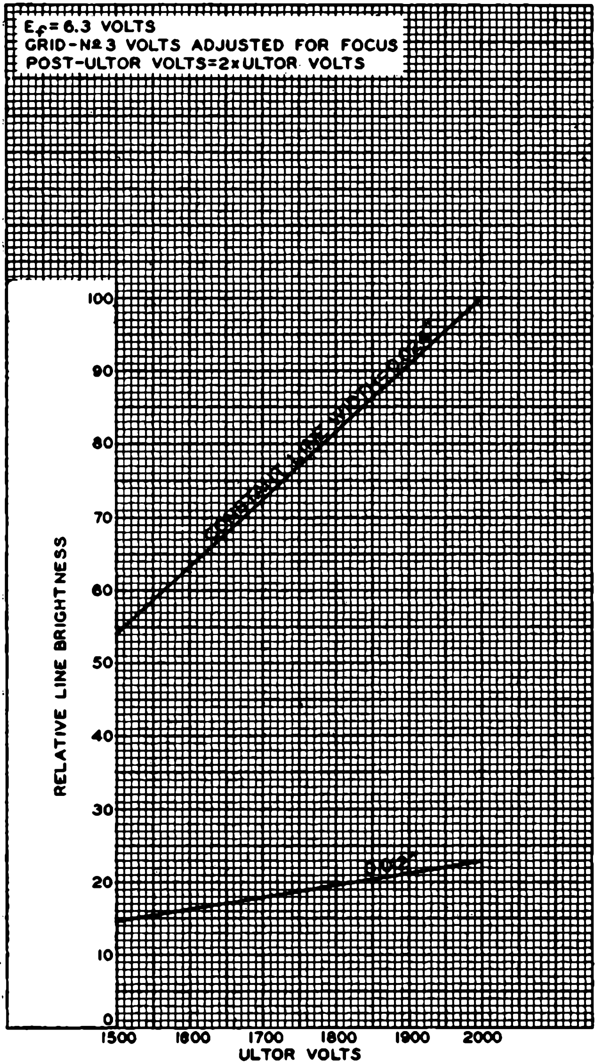
5ABP1

TYPICAL CHARACTERISTICS



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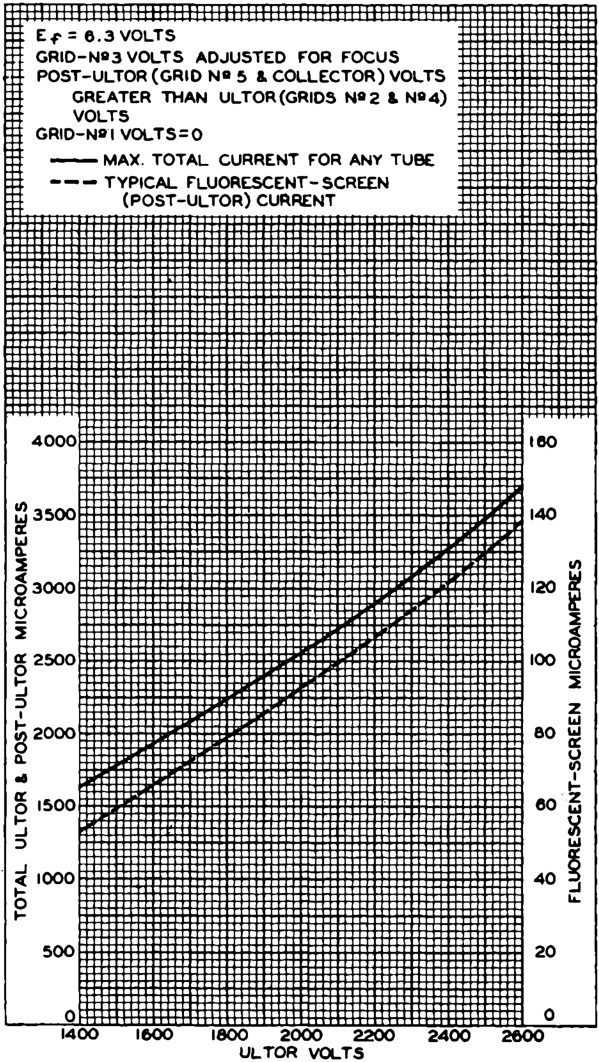
5ABP1

5ABP1

CHARACTERISTICS



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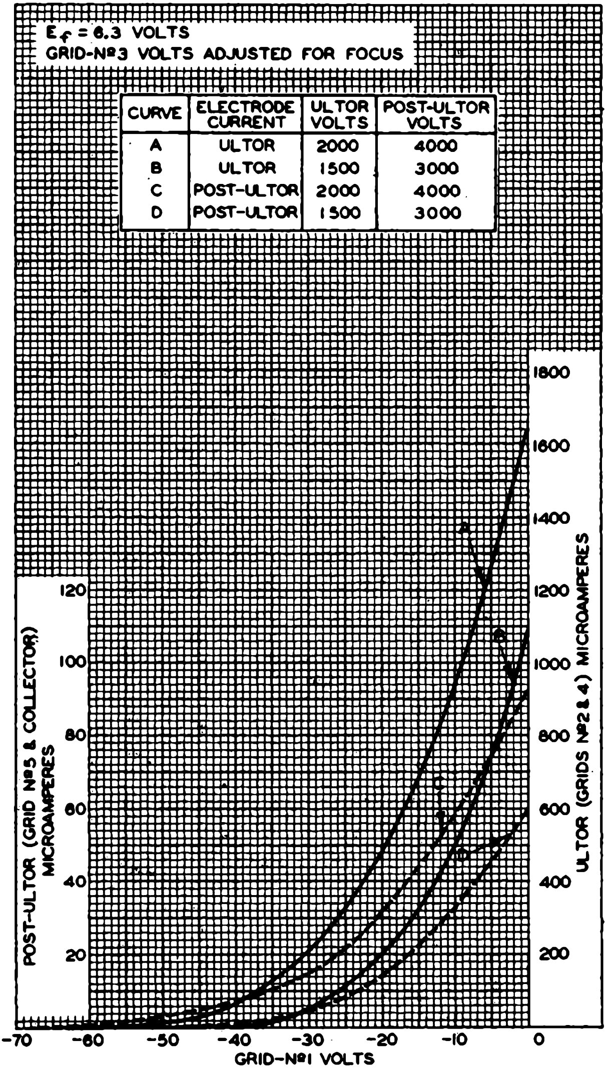
AVERAGE CHARACTERISTICS



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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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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5AUP24

COLOR FLYING-SPOT CATHODE-RAY TUBE

ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

For use in Flying-Spot Color Video-Signal Generators

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6	amp

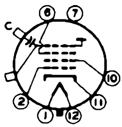
Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes	8	μμf
Cathode to all other electrodes	5	μμf
External conductive neck coating to ultor*	500 max.	μμf
	100 min.	μμf

Faceplate, Flat	Clear Glass
Phosphor, Metal-Backed (For Curves, see front of this section)	P24
Fluorescence	Light Green
Phosphorescence	Light Green
Persistence	Extremely 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"
Mounting Position	Any
Weight (Approx.)	1.4 lbs
Cap	Recessed Small Cavity (JETEC No.J1-21)
Base	Small-Shell Duodecal 7-Pin (JETEC No.B7-51)

BOTTOM VIEW

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



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

SOCKET CONTACTS CORRESPONDING TO VACANT PIN POSITIONS 3, 4, 5, 8, AND 9 SHOULD BE REMOVED

Maximum Ratings, *Design-Center Values:*

ULTOR* VOLTAGE	27000 max.	volts
GRID-No.3 VOLTAGE	6000 max.	volts
GRID-No.2 VOLTAGE	350 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 5AUP24, the ultor function is performed by grid No.4. Since grid No.4 and collector are connected together within the 5AUP24, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

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5AUP24

COLOR 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	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

Characteristics Range Values for Equipment Design:

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

Grid-No.3 Voltage for Focus with Ultor Current of 200 µamp.	17% to 21.5% of E_{c_4}	volts
Grid-No.2 Voltage when circuit design utilizes fixed grid-No.1 voltage (E_{c_1}) for visual extinction of undeflected focused spot	2 to 5 times E_{c_1}	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot when circuit design utilizes grid-No.2 voltage (E_{c_2}) at fixed value	-20% to -50% of E_{c_2}	volts
Maximum Grid-No.3 Current for ultor current of 200 µamp.	170	µamp
Grid-No.2 Current	-15 to +15	µamp

Examples of Use of Design Ranges:

For ultor voltage of	*27000*	*volts*
Grid-No.3 Voltage for Focus with Ultor Current of 200 µamp.	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 20000 volts.

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5AUP24

COLOR FLYING-SPOT CATHODE-RAY TUBE

OPERATING CONSIDERATIONS

Resolution of better than 800 lines at the center of the reproduced picture can be produced by the 5AUP24 when it is operated with 27000 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.

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

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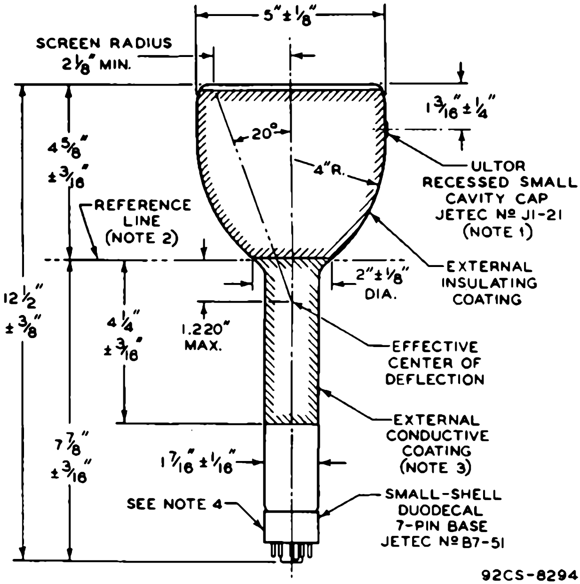
5AUP24

COLOR FLYING-SPOT CATHODE-RAY TUBE



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

NOTE 3: EXTERNAL CONDUCTIVE 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

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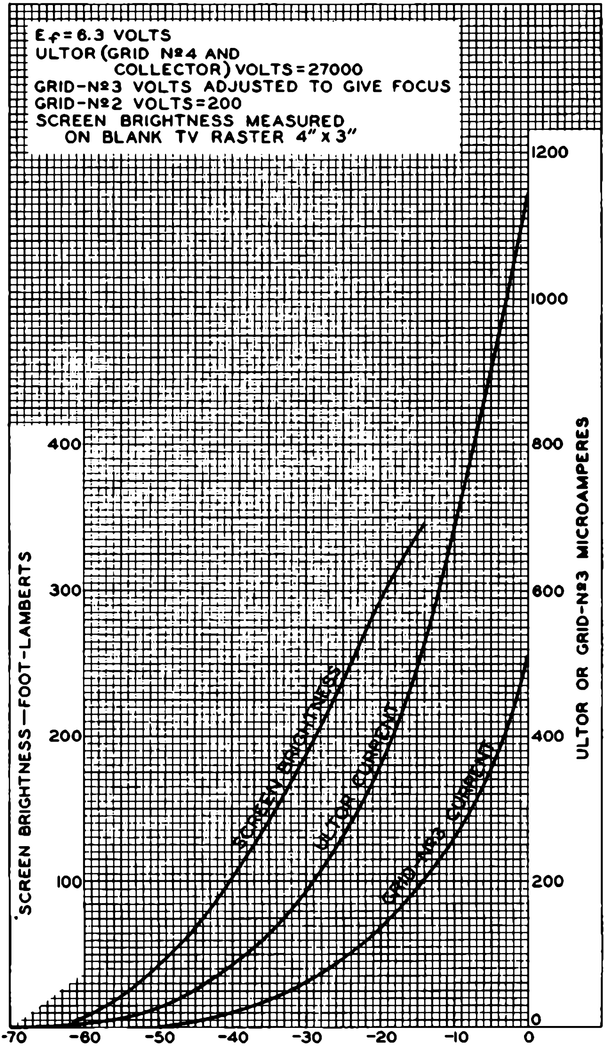
5AUP24

AVERAGE CHARACTERISTICS



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92CM-8343

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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

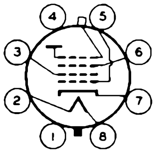
Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes	6	$\mu\mu f$
Cathode to all other electrodes	5	$\mu\mu f$
External conductive coating to ultor●	750 max.	$\mu\mu f$
	500 min.	$\mu\mu f$

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.

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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.

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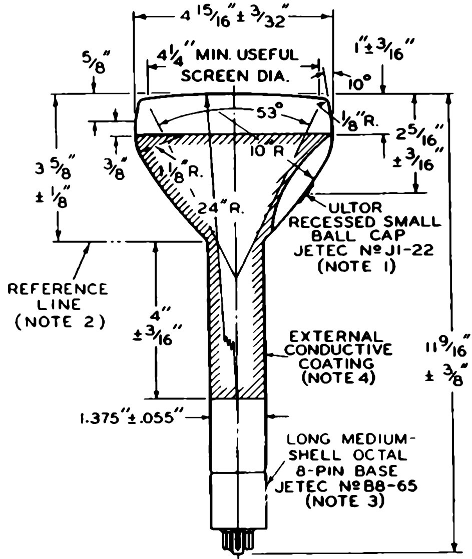
5AYP4

VIEW-FINDER KINESCOPE



92CS-8559

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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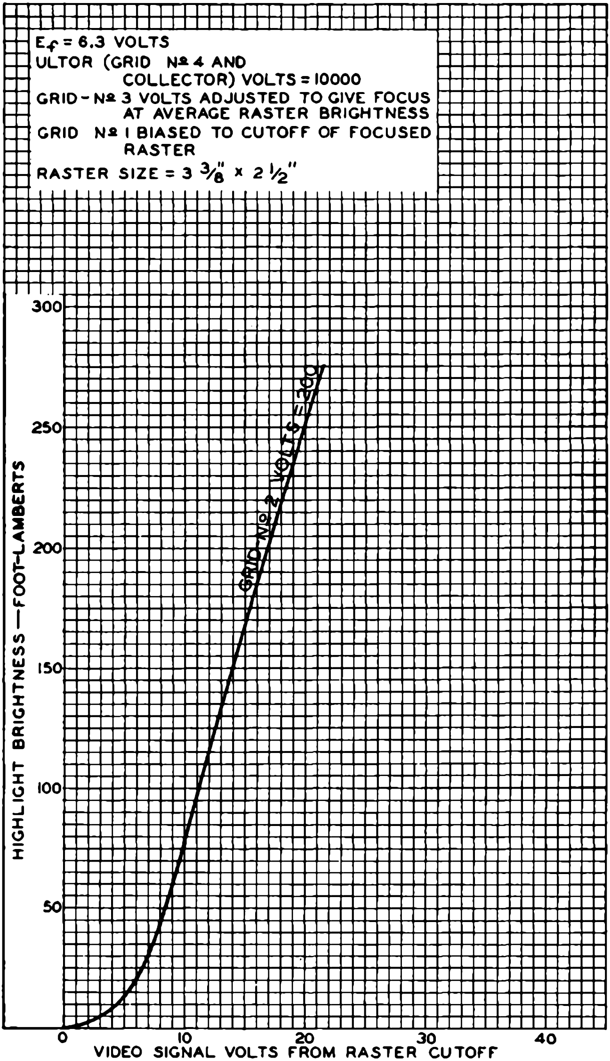
5AYP4

AVERAGE GRID-DRIVE CHARACTERISTIC



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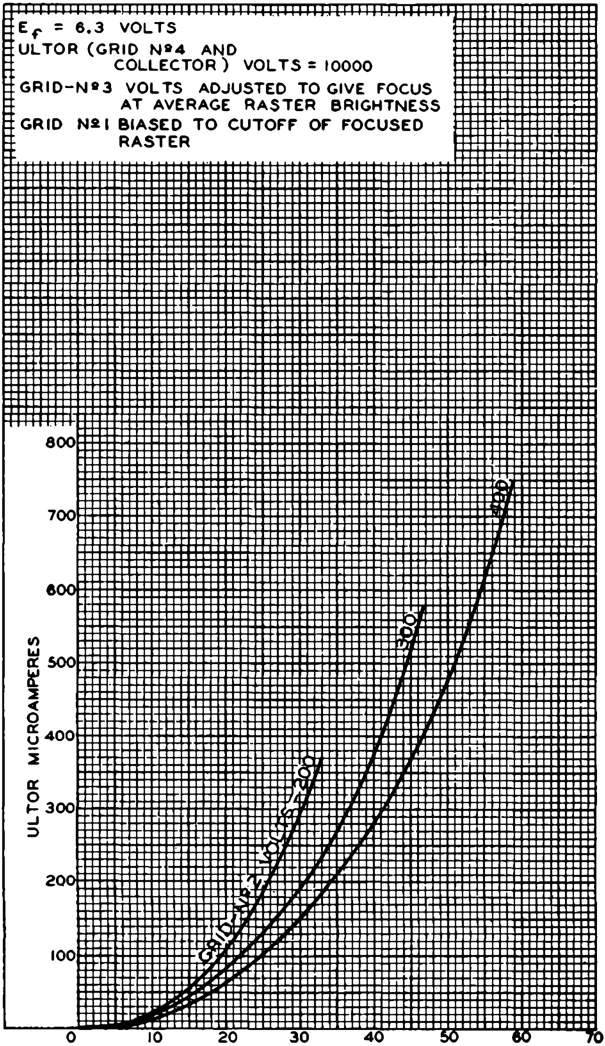
5AYP4

AVERAGE GRID-DRIVE CHARACTERISTICS



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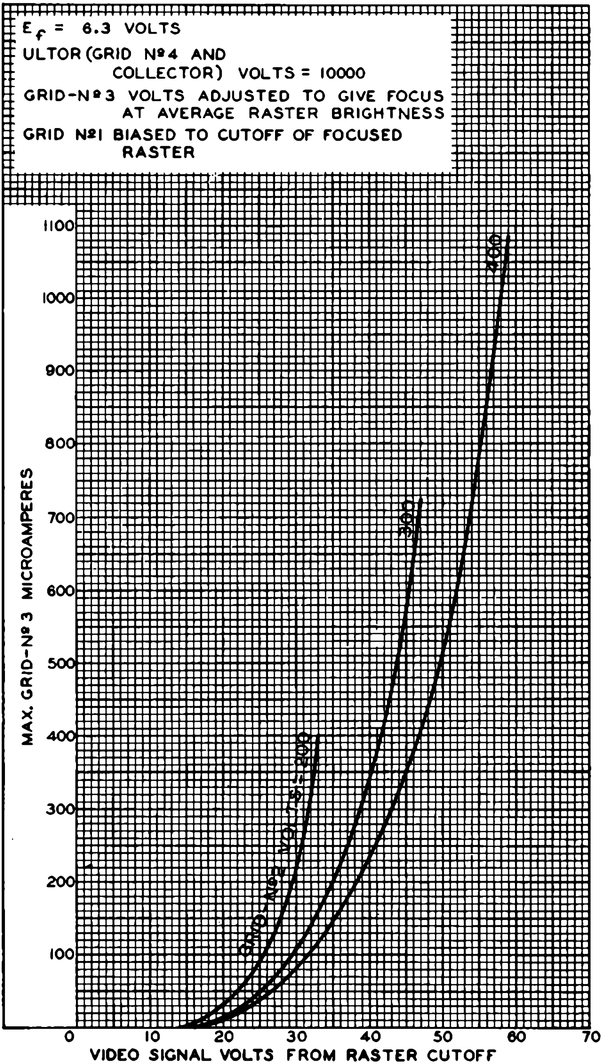
5AYP4

AVERAGE GRID-DRIVE CHARACTERISTICS



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^{o}
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. ^{o}C

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5AZP4

PROJECTION KINESCOPE

Maximum Ratings, *Absolute Values:*

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

Equipment Design Ranges:

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

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

Examples of Use of Design Ranges:

For ultor voltage of 36000 volts

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

*: see next page.

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5AZP4

PROJECTION KINESCOPE

Maximum Circuit Values:

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

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

OPERATING CONSIDERATIONS

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

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

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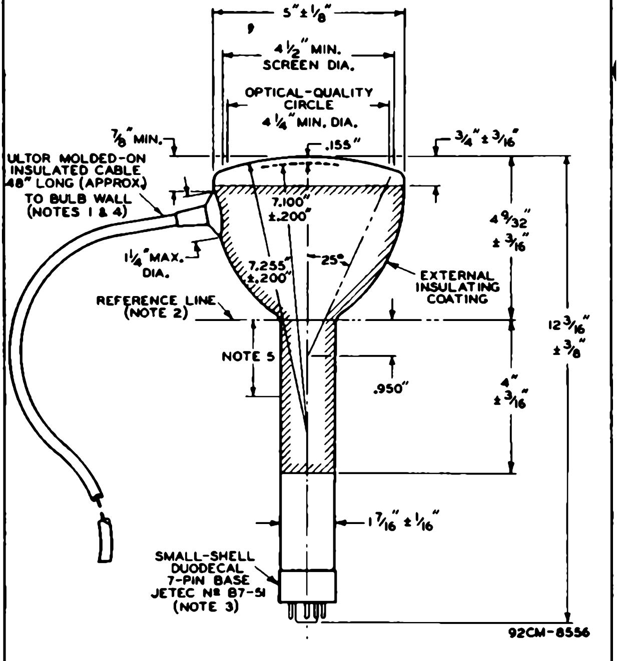
5AZP4

PROJECTION KINESCOPE



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5AZP4

PROJECTION KINESCOPE

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

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

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

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

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

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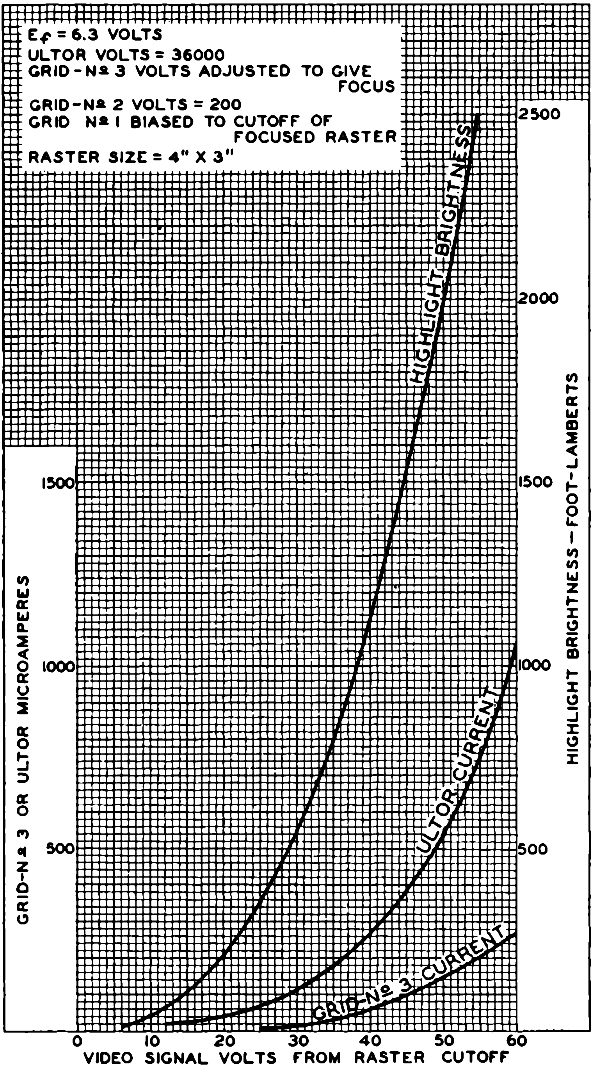
5AZP4

AVERAGE DRIVE CHARACTERISTICS



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92CM-8549

5BP1-A

5BP1-A

HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 5BP1

General:

Heater, for Unipotential Cathode:

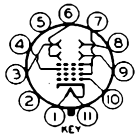
Voltage	6.3 ± 10%	ac or dc volts
Current	0.6	amp.

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.

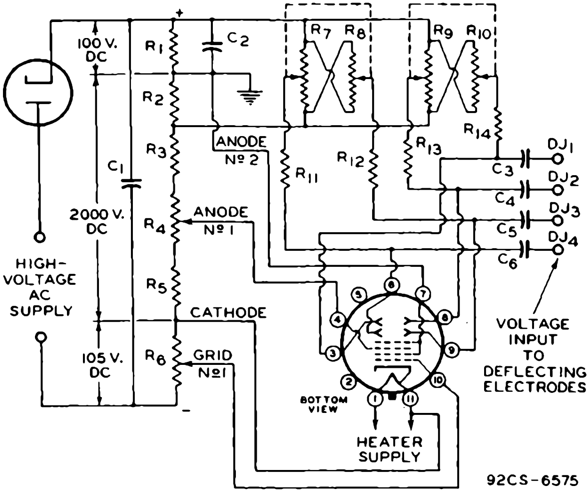
Maximum Circuit Values:

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.

5BP1-A
HIGH-VACUUM CATHODE-RAY TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.1 µf
C2: 1.0 µf
C3 C4 C5 C6: 0.05-µf Blocking Capacitors*
R1 R2: 2 Megohms
R3: 6 Megohms
R4: 2-Megohm Potentiometer
R5: 1.0 Megohm
R6: 0.5-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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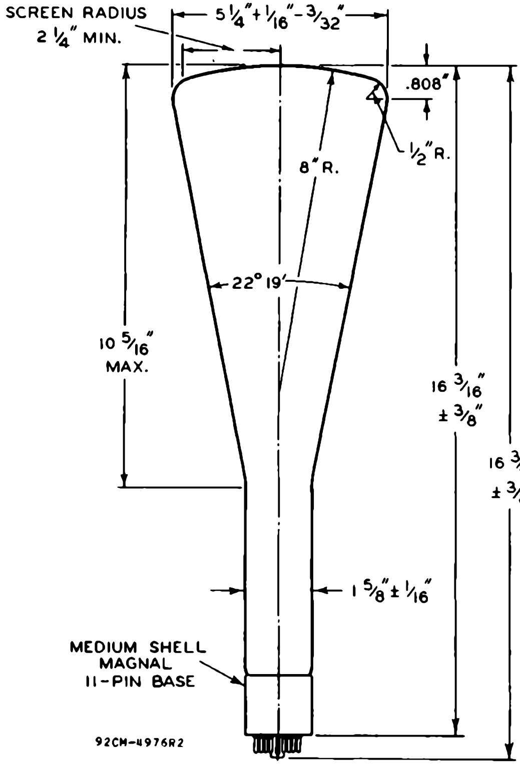
5BP1-A

HIGH-VACUUM CATHODE-RAY TUBE



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

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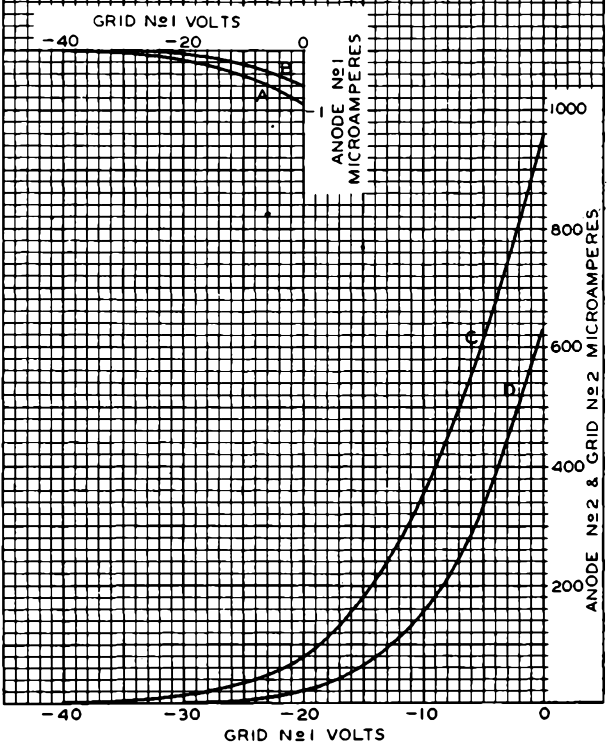
5BP1-A

AVERAGE CHARACTERISTICS

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

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



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5CP1-A
OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

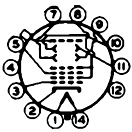
Voltage	6.3	ac or dc volts
Current	0.6	amp

Direct Interelectrode Capacitances (Approx.):

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

Phosphor (For Curves, see front of this Section)	P1
Fluorescence and Phosphorescence	Green
Persistence of Phosphorescence	Medium
Focusing Method	Electrostatic
Deflection Method	Electrostatic
Overall Length	16-3/4" ± 3/8"
Greatest Diameter of Bulb	5-1/4" ± 3/32"
Minimum Useful Screen Diameter	4-1/2"
Mounting Position	Any
Cap	Recessed Small Ball (JETEC No.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°; Cap (on same side of tube as pin 5), 10°.

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

RCA

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 $Eb_3 = 2 \times Eb_2$	
DJ1 & DJ2	39 to 53 v dc/in./kv of Eb_2	
DJ3 & DJ4	33 to 45 v dc/in./kv of Eb_2	
	When $Eb_3 = Eb_2$	
DJ1 & DJ2	31 to 42 v dc/in./kv of Eb_2	
DJ3 & DJ4	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:				
DJ1 & DJ2 . . .	62 to 84	59 to 80	78 to 106	□
DJ3 & DJ4 . . .	54 to 74	50 to 68	66 to 90	□

Maximum Circuit Values:

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

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

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

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.

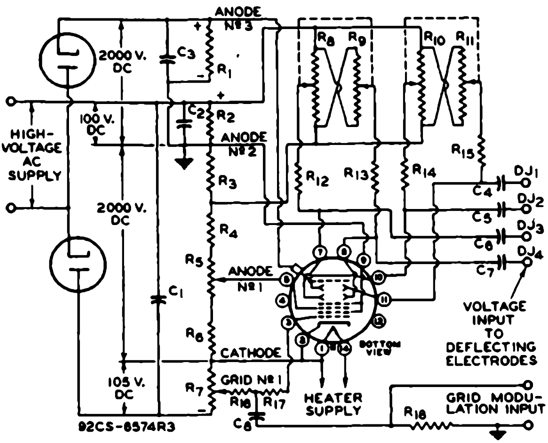
\#\# With heater voltage of 6.3 volts, anode-No.3 voltage of 4000 volts, anode-No.2 voltage of 2000 volts, anode-No.1 voltage adjusted to focus, grid-No.1 voltage adjusted to give spot that is just visible, each deflecting electrode connected through 1-megohm resistor to anode No.2, and tube shielded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

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT

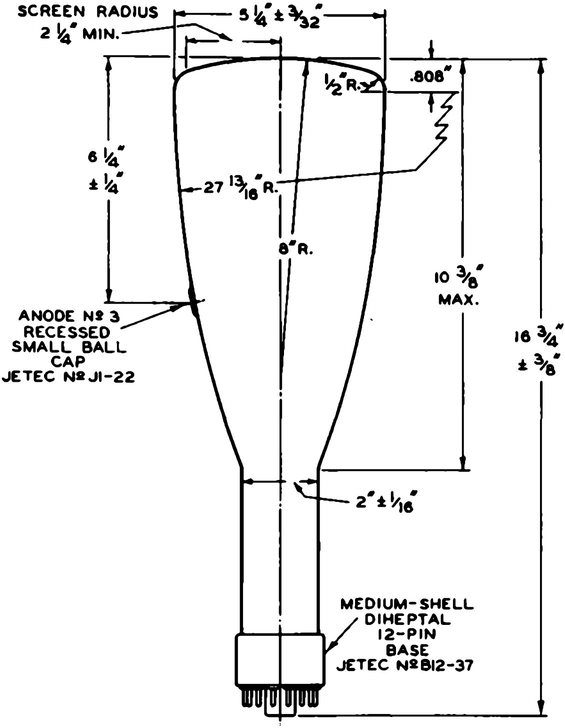


C1: 0.1 µf, 2500 Volts
C2: 1.0 µf, 200 Volts
C3: 0.1 µf, 2500 Volts
C4 C5 C6 C7: 0.05-µf, Blocking Capacitors*
C8: 0.0001 µf, 2500 Volts
R1: 50 Megohms (Five 10-Megohm, 1-Watt Resistors in Series)
R2 R3: 2 Megohms, 0.5 Watt
R4: 5.5 Megohms, 2 Watts
R5: 2-Megohm Potentiometer
R6: 1.5 Megohms, 0.5 Watt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

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5CP1-A
OSCILLOGRAPH TUBE



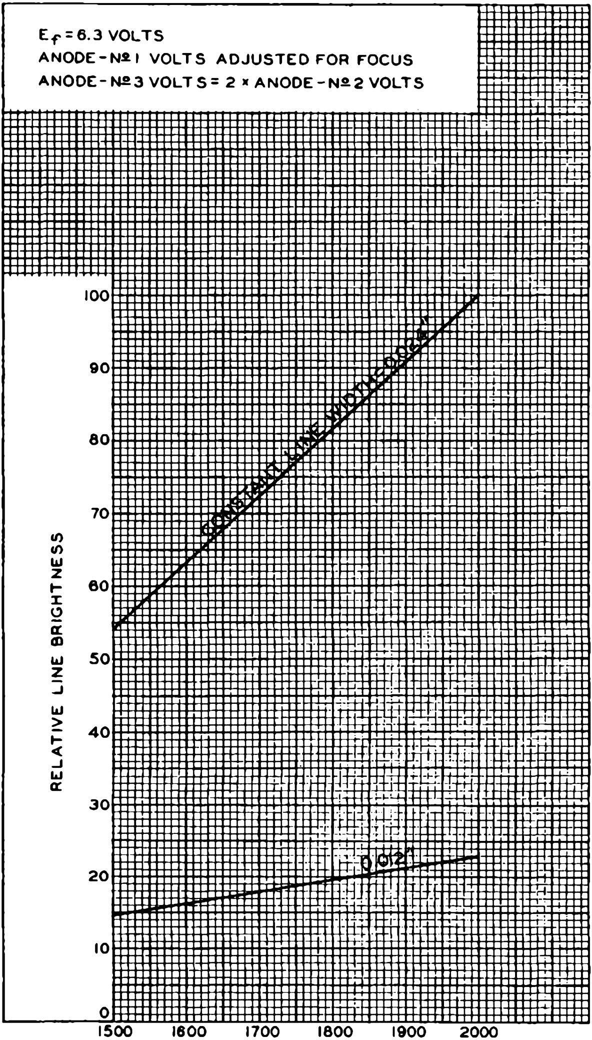
℄ OF BULB WILL NOT DEVIATE MORE THAN 2°
IN ANY DIRECTION FROM PERPENDICULAR
ERECTED AT CENTER OF BOTTOM OF BASE

92CM-6408R4

RCA

5CP1-A

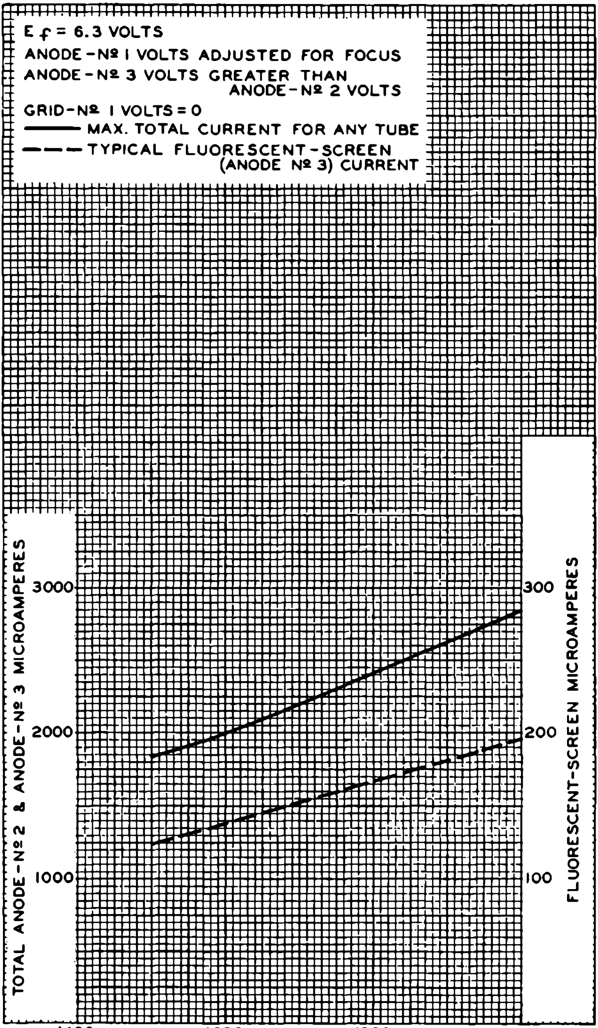
CHARACTERISTICS



5CPI-A

5CPI-A

CHARACTERISTICS



DEC. 24, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

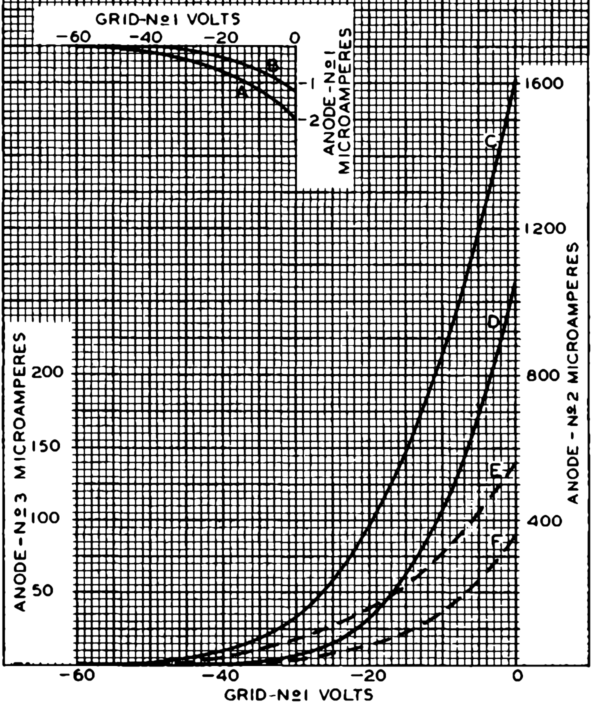
92CM-6821

RCA

5CP1-A
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	2000-4000
B	ANODE No 1	1500	1500-3000
C	ANODE No 2	2000	4000
D	ANODE No 2	1500	3000
E	ANODE No 3	2000	4000
F	ANODE No 3	1500	3000



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

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.

5FP4-A

KINESCOPE

MAGNETIC FOCUS MAGNETIC DEFLECTION

DATA

General:

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

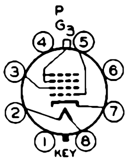
Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to All Other Electrodes . . . . . . 8.5 . μμf
- Cathode to All Other Electrodes . . . . 5.0 . μμf

Phosphor (For Curves see front of this section) No.4
- Fluorescence . . . . White
- Persistence . . . . Medium

Focusing Method . . . . Magnetic
Deflection Method . . . . Magnetic
Solid Deflection Angle (Approx.) . . . . 53^{o}
Overall Length . . . . 11-1/8" ± 3/8"
Greatest Diameter of Bulb . . . . 4-15/16" ± 3/32"
Minimum Useful Screen Diameter . . . . 4-1/4"
Raster Size (Approx.) . . . . 3" x 4"
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 & GRID-No.3 VOLTAGE . . . . 8000 max. volts
GRID-No.2 VOLTAGE . . . . 300 max. volts
GRID-No.1 VOLTAGE:
- Negative bias value . . . . 125 max. volts
- Positive bias 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

Typical Operation:

Anode & Grid-No.3 Voltage* . . . . 6000 . . volts
Grid-No.2 Voltage . . . . 250 . . volts
Grid-No.1 Voltage° . . . . -45 . . volts
Focusing-Coil Current (DC)▲ . . . . 122 approx. ma.
Horizontal Deflecting Coil Current (DC)□ . 340 approx. ma.

*, °, ▲, □: See next page.

5FP4-A
KINESCOPE

Maximum Circuit Values:

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

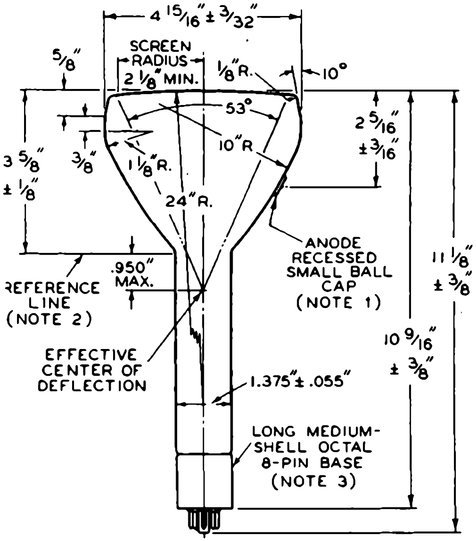
• Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 4000 volts.

○ Visual extinction of undeflected focused spot. Supply should be adjustable to + 55% and - 45% of indicated value.

▲ For RCA Focusing Coil, Stock No.52446, or equivalent, with the combined grid-No.1-bias voltage and video-signal voltage adjusted to produce a highlight brightness of 10 foot-lamberts on a 2-7/8" x 3-7/8" picture area.

□ To deflect beam from side to side of a raster 3-7/8" wide with RCA Deflection Yoke, Stock No.51586, or equivalent. Coil current varies directly as the square root of the anode voltage.

5FP4-A
KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10°. ANODE TERMINAL IS ON SAME SIDE OF TUBE AS PIN No.5.

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

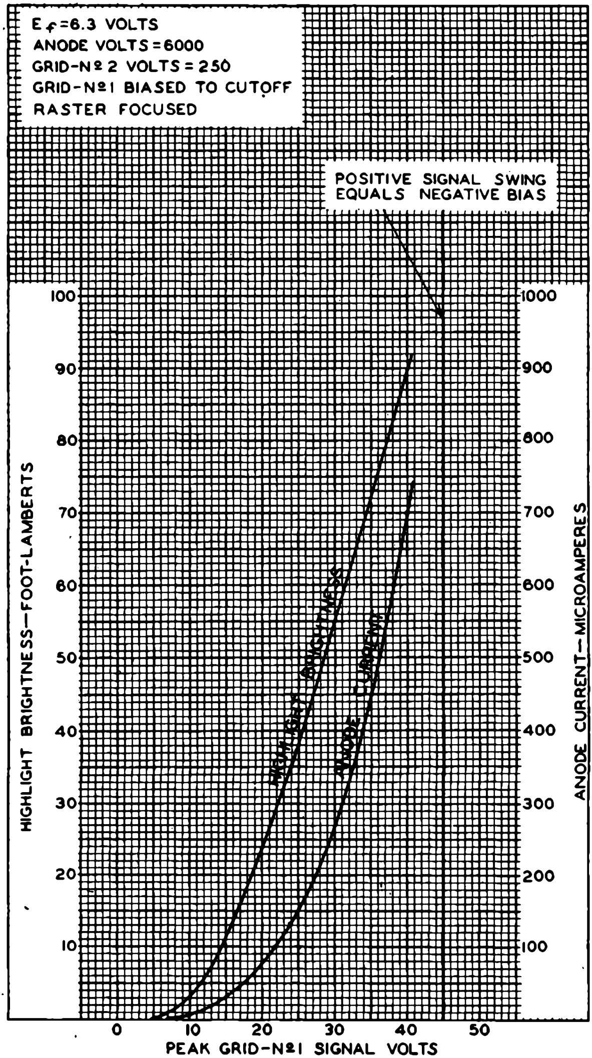
NOTE 3: ℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

92CM-6362R3

5FP4-A

5FP4-A

AVERAGE CHARACTERISTICS



FEB. 26, 1946

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6683

5FP7-A

RCA

5FP7-A
OSCILLOGRAPH TUBE

MAGNETIC FOCUS MAGNETIC DEFLECTION

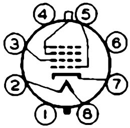
DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to All Other Electrodes	8.5	μμf
Grid No.2 to All Other Electrodes	7	μμf
Cathode to All Other Electrodes	5	μμf
Phosphor (For Curves, see front of this Section)		No.7
Fluorescence		Blue
Phosphorescence		Greenish-Yellow
Persistence of Phosphorescence		Long
Focusing Method		Magnetic
Deflection Method		Magnetic
Deflection Angle (Approx.)		53°
Overall Length		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
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.

5FP7-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 9 mm radius concentric with the center of the tube face.

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

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5FP15-A

5FP15-A
OSCILLOGRAPH TUBE

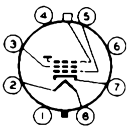
MAGNETIC FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
  Voltage . . . . 6.3 . . . . ac or dc volts
  Current . . . . 0.6 ± 10% . . . . amp
Direct Interelectrode Capacitances (Approx.):
  Grid No.1 to all other electrodes . . . . . 8 $\mu\mu$f
  Cathode to all other electrodes . . . . . . 5 $\mu\mu$f
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.

RCA

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.

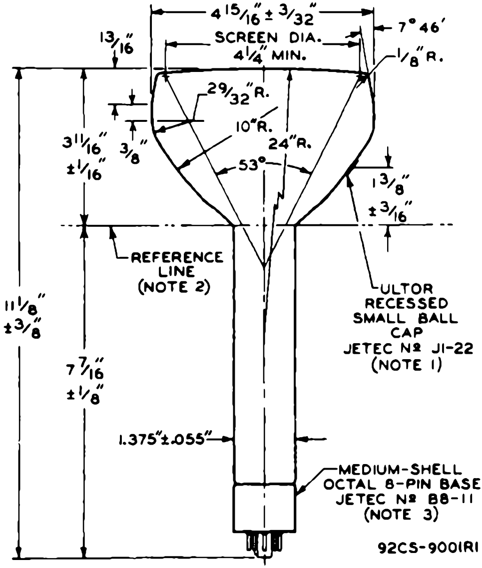
°° For specimen focusing coil similar to JETEC Focusing Coil No.106 positioned with air gap toward faceplate and center line of air gap 2-3/4" from Reference Line *(See Dimensional Outline)* and ultor current of 200 microamperes.

\## 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.

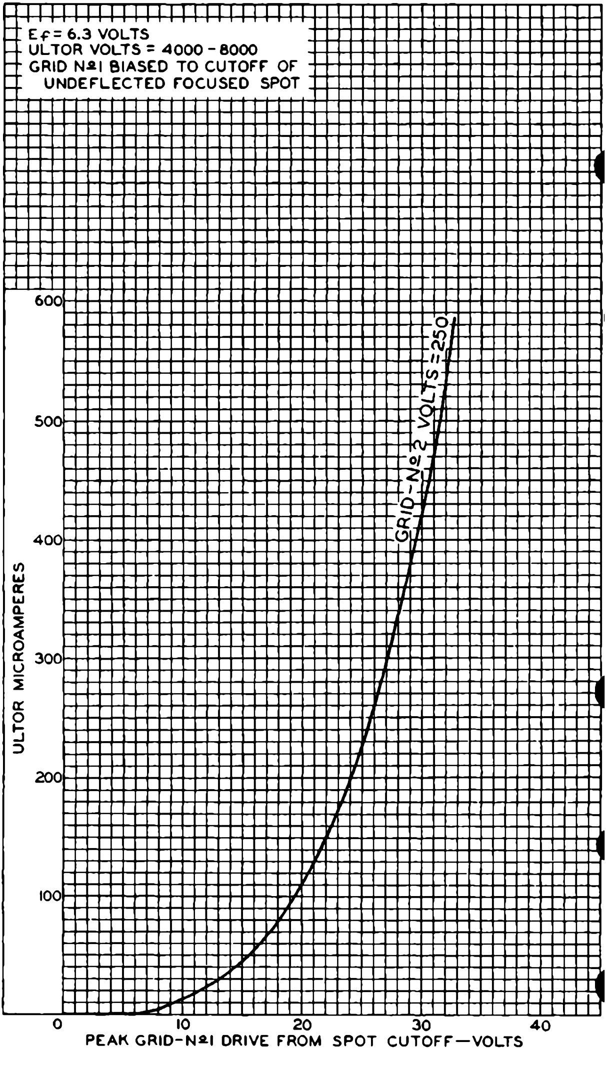
NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.430" + .003" - .000" I.D. AND 2" LONG WILL REST ON BULB CONE.

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.

5FP15-A

5FP15-A

AVERAGE GRID-DRIVE CHARACTERISTIC



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9002

RCA

5TP4
PROJECTION KINESCOPE

ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA

General:

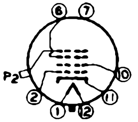
Heater, for Unipotential Cathode:
- Voltage . . . . 6.3 . . . . . . ac or dc volts
- Current . . . . 0.6 . . . . amp

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.

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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.

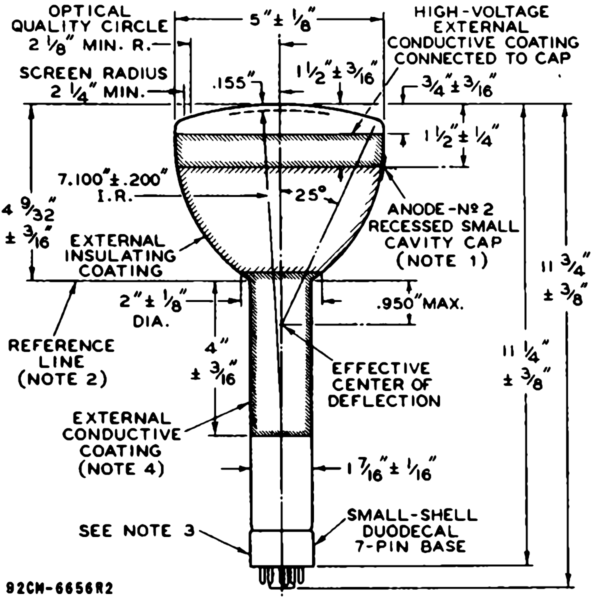
° Visual extinction of undeflected focused spot.

→ Indicates a change.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

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.

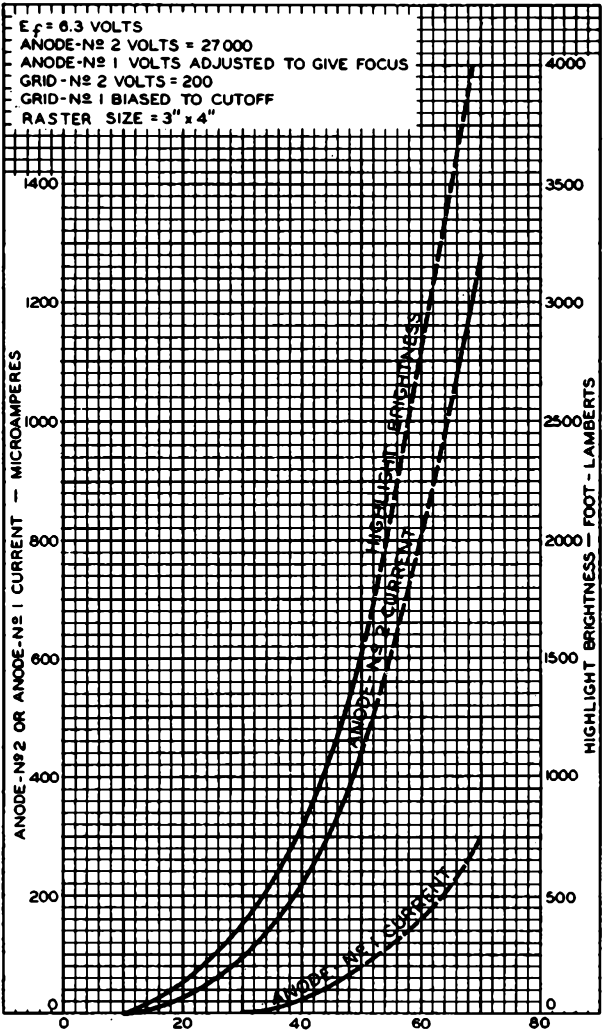
NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY.

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

RCA

5TP4

AVERAGE CHARACTERISTICS



RCA

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 . . . μμf
- DJ1 to DJ2 . . . . 2.5 . . . μμf
- DJ3 to DJ4 . . . . 2.5 . . . μμf
- DJ1 to All Other Electrodes . . . . 11.0 . . . μμf
- DJ2 to All Other Electrodes . . . . 8.0 . . . μμf
- DJ3 to All Other Electrodes . . . . 7.0 . . . μμf
- DJ4 to All Other Electrodes . . . . 8.0 . . . μμf

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"

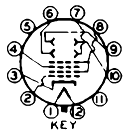
Greatest Diameter of Bulb . . . . 5-1/4" ± 3/32"

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 DJ3
Pin 7 - Deflecting Electrode DJ4



Pin 8 - Anode No.2, Grid No.2
Pin 9 - Deflecting Electrode DJ2
Pin 10 - Deflecting Electrode DJ1
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°.

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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 (Eb_2) 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.

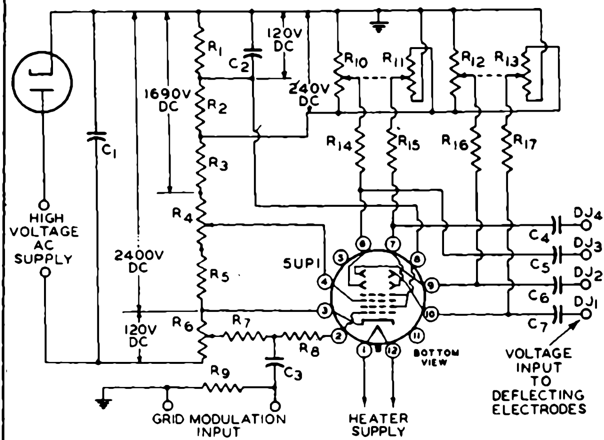
5UPI

RCA

5UPI

OSCILLOGRAPH TUBE

TYPICAL CIRCUIT



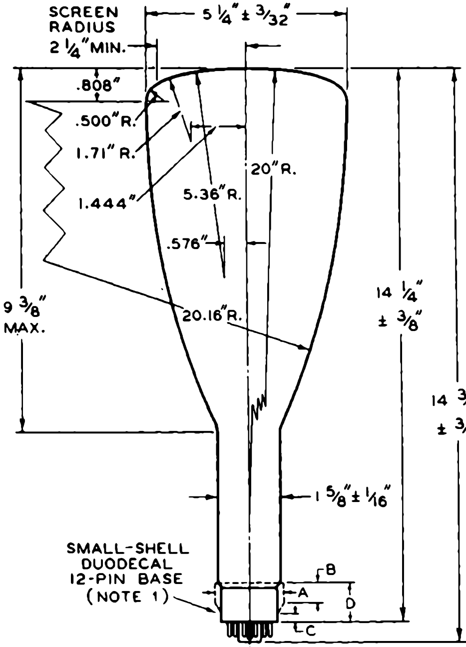
92CM-6819

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:

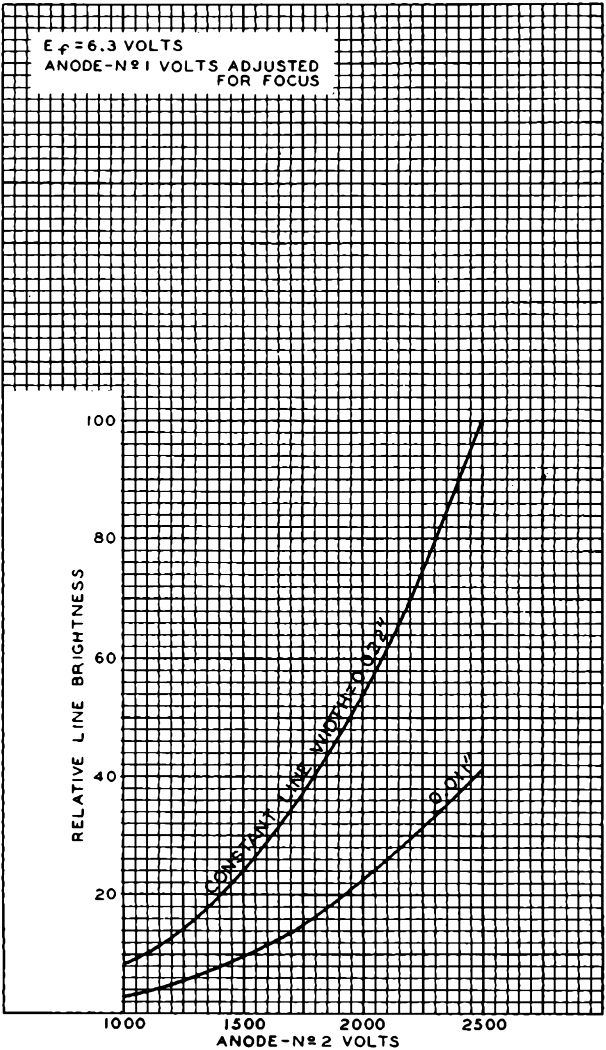
A = 1.85" MAX., B = 0.500", C = 0.200" MIN., D = 0.925".

92CM-6763

RCA

5UP1

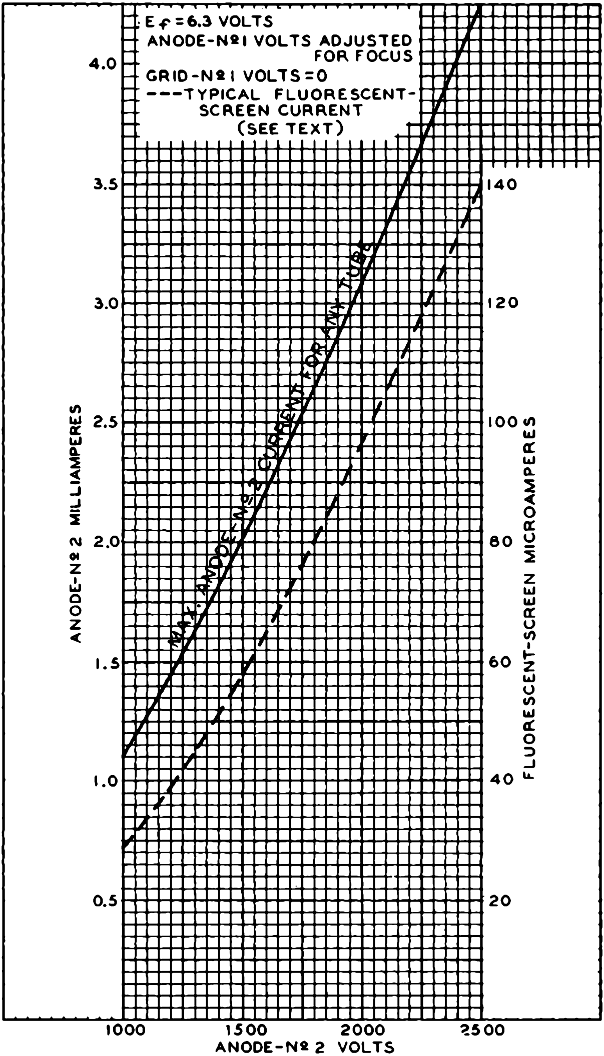
AVERAGE CHARACTERISTICS



RCA

5UP1

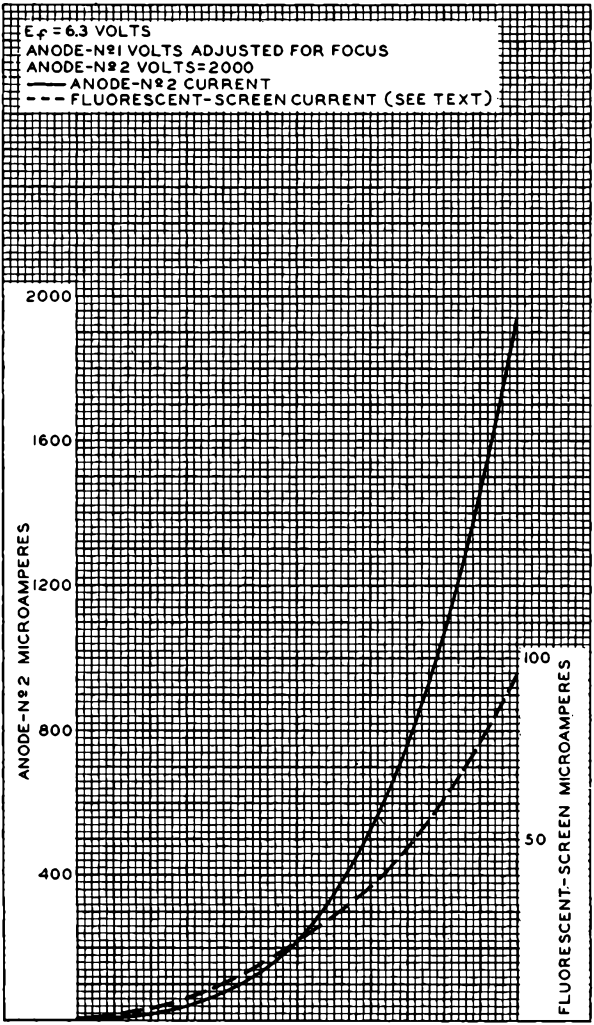
CHARACTERISTICS



5UP1

5UP1

AVERAGE CHARACTERISTICS



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

RCA

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"

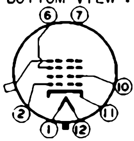
Raster Size (Approx.) . . . . 2-1/2" x 3-3/8"

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.

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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.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

5WP11

TRANSCRIBER KINESCOPE

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

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

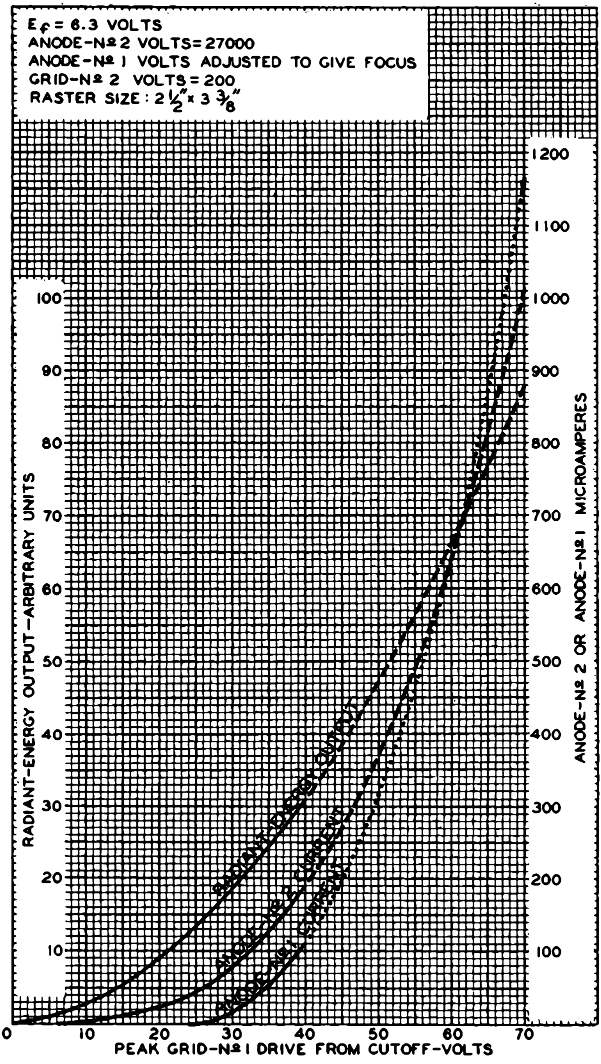
OUTLINE DIMENSIONS for the 5WP11 are the same as those for the 5WP15

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5WP11

5WP11

AVERAGE CHARACTERISTICS



OCTOBER 28, 1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7105

5WP15

RCA 5WP15

FLYING-SPOT CATHODE-RAY TUBE

ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

For use in Flying-Spot Video-Signal Generators

DATA

General:

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

Direct Interelectrode Capacitances:
- Grid No.1 to All Other Electrodes . . . . . . 7.5 . . μμf
- Cathode to All Other Electrodes . . . . . . 5 . . μμf
- External Conductive Coating to Anode No.2 . . { 500 max. μμf; 100 min. μμf }

Phosphor No.15
- Fluorescence:
  - Visible Radiation . . . . Blue-Green
  - Invisible Radiation . . . . Near Ultraviolet
- Phosphorescence:
  - Persistence of Visible Radiation . . . . Very Short
  - Persistence of Invisible Radiation . . . Extremely Short

Focusing Method . . . . Electrostatic

Deflection Method . . . . Magnetic

Deflection Angle (Approx.) . . . . 50^{o}

Overall Length . . . . 11-7/16" ± 3/8"

Greatest Diameter of Bulb . . . . 5" ± 1/8"

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

Minimum Inside Diameter of Deflecting Coil . . . . . . 1.505"

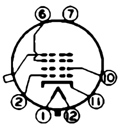
Mounting Position . . . . Any

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

JUNE 15, 1948 TENTATIVE DATA

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5WP15
FLYING-SPOT CATHODE-RAY TUBE

Typical Operation:

Anode-No.2 Voltage*	20000 . .	volts
Anode-No.1 Voltage Range for Anode-No.2 Current of 150 μamp. . .	3000 to 3800	volts
Grid-No.2 Voltage**	200 . .	volts
Grid-No.1 Voltage for Visual Cutoff° .	-42 to -98	volts
Anode-No.2 Current	150 . .	μamp
Max. Anode-No.1 Current	200 . .	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

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

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

° Visual extinction of undeflected focused spot.

OPERATING NOTES

Soft x-rays are produced when the 5WP15 is operated with an anode-No.2 voltage above approximately 20000 volts. These rays can constitute a health hazard unless the tube is adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

Resolution of better than 700 lines at the center of the reproduced picture can be produced by the 5WP15. 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.

The blue-green radiation decays hyperbolically to about 30 per cent of its initial value in 1.5 microseconds. The ultra-

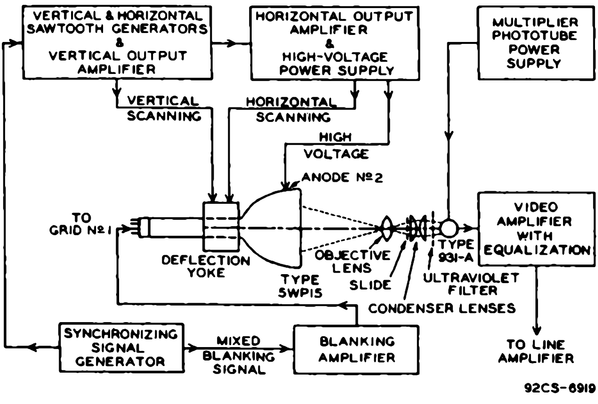
5WP15
FLYING-SPOT CATHODE-RAY TUBE

violet radiation has an equivalent exponential decay with a time constant less than 0.05 microsecond. 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 when optimum efficiency of the screen is desired at maximum anode-No. 2 current.

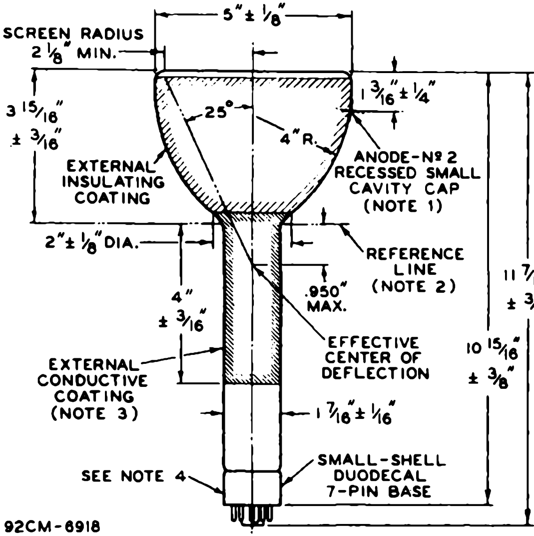
Operation of the 5WP15 results in gradual browning of the face. The rate of browning increases markedly with increase in anode-No. 2 voltage, is proportional to beam current, and is inversely proportional to the scanned area. The browning is most noticeable during initial operation; thereafter, a gradual increase in the amount of browning will be observed during the life of the tube.

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



5WP15

5WP15
FLYING-SPOT CATHODE-RAY TUBE



92CM-6918

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" AND 2" LONG WILL REST ON BULB CONE.

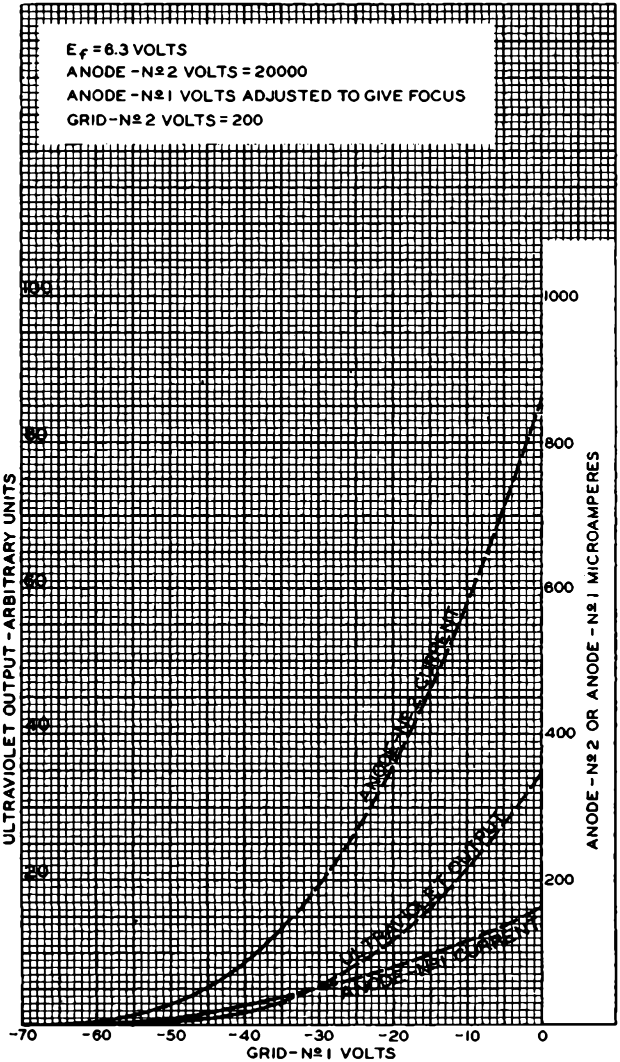
NOTE 3: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

5WP15

5WP15

AVERAGE CHARACTERISTICS

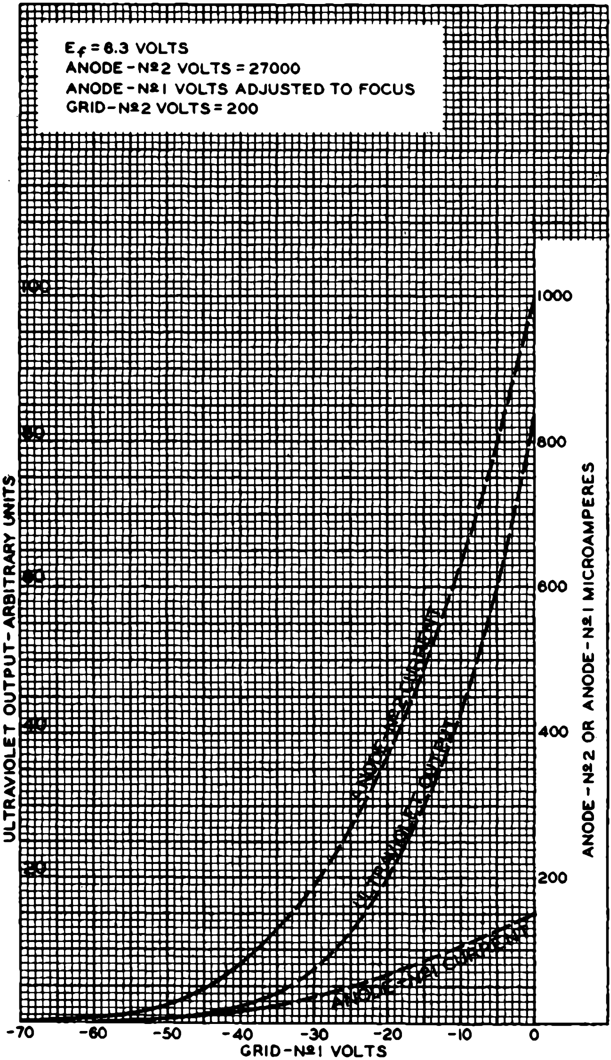


5WP15

RCA

5WP15

AVERAGE CHARACTERISTICS



RCA

5ZP16

FLYING-SPOT CATHODE-RAY TUBE

ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

For use in Flying-Spot Video-Signal Generators

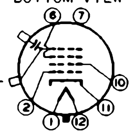
DATA

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	$\mu\mu f$
Cathode to All Other Electrodes	5	$\mu\mu f$
External Conductive Coating to Anode	500 max.	$\mu\mu f$
	100 min.	$\mu\mu f$
Phosphor (For Curves, see front of this Section)		No.16
Fluorescence		Violet and Near-Ultraviolet
Phosphorescence		Violet and Near-Ultraviolet
Persistence		Extremely Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angle (Approx.)		40°
Overall Length		14-3/8" ± 3/8"
Greatest Diameter of Bulb		5" ± 1/8"
Minimum Useful Screen Diameter		4-1/4"
Mounting Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Base		Small-Shell Duodecal 7-Pin (JETEC No.B7-51)

BOTTOM VIEW

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



Pin 11 - Cathode
Pin 12 - Heater
Cap - Anode
C - External Conductive Coating

SOCKET CONTACTS CORRESPONDING TO VACANT PIN POSITIONS 3, 4, 5, 8, & 9 SHOULD BE REMOVED

Maximum Ratings, *Design-Center Values*:

ANODE VOLTAGE	27000 max.	volts
GRID-No.3 VOLTAGE	7000 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	150 max.	volts
Heater positive with respect to cathode	150 max.	volts

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5ZP16

FLYING-SPOT CATHODE-RAY TUBE

Typical Operation:

Anode Voltage*	20000	27000	volts
Grid-No.3 Voltage Range for Anode Current as Indicated	4700 ± 12%	6300 ± 12%	volts
Grid-No.2 Voltage**	200	200	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot°	-70	-70	volts
Anode Current	25	15	μamp
Max. Grid-No.3 Current for Anode Current as Indicated	75	25	μamp
Grid-No.2 Current Range	-15 to +15	-15 to +15	μamp

Maximum Circuit Values:

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

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 20000 volts.

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

° Subject to variation of ± 40% when grid-No.2 voltage is maintained at 200 volts.

OPERATING NOTES

X-Ray Warning. X-ray radiation is produced at the face of the 5ZP16 when it is operated at its normal anode 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.

Resolution of better than 1000 lines at the center of the reproduced picture can be produced by the 5ZP16 when it is operated with 27000 volts on the anode. At lower anode 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 anode current. For any particular value of anode current, the ultraviolet output is approximately 50 per cent higher when the 5ZP16 is operated with 27000 volts on the anode than when operated with 20000 volts.

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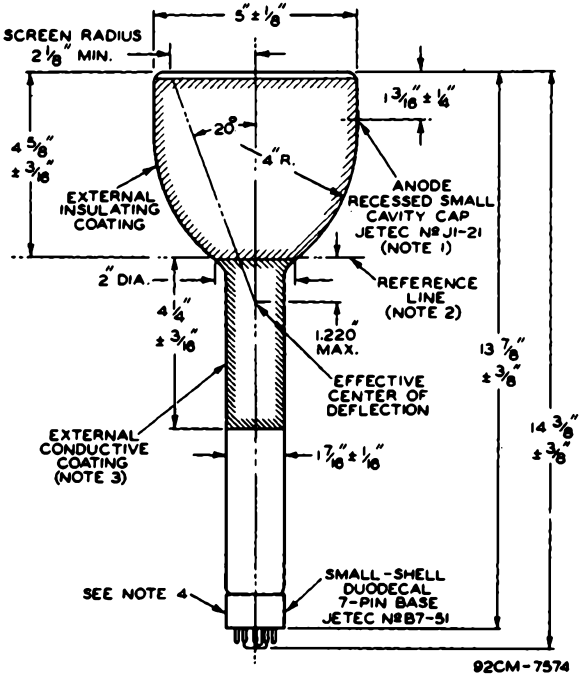
RCA

5ZP16

FLYING-SPOT CATHODE-RAY TUBE



92CM-7574

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

NOTE 2: 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 OF PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: EXTERNAL CONDUCTIVE 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.

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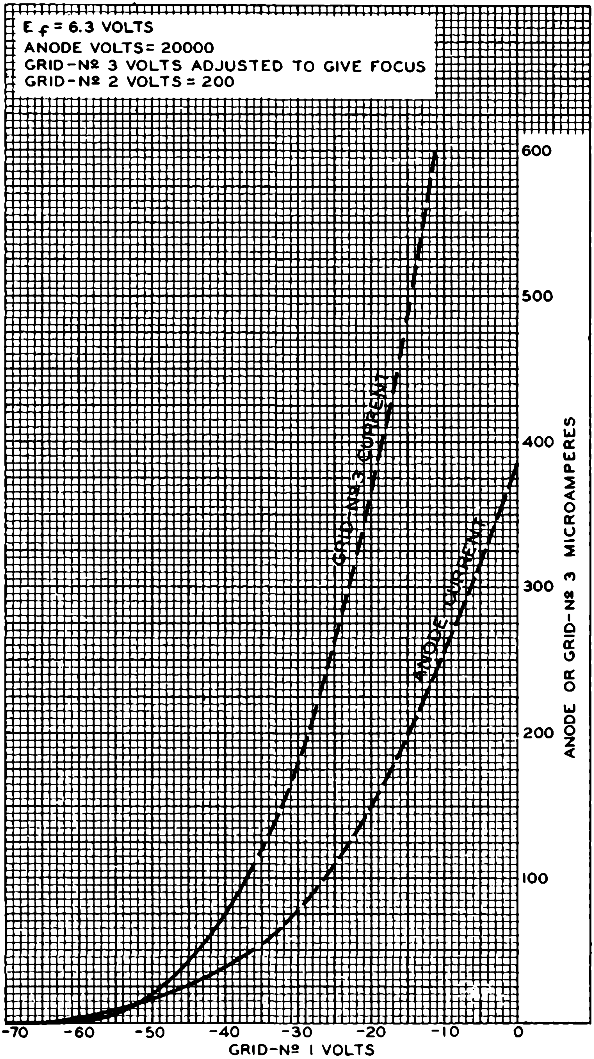
RCA

5ZP16

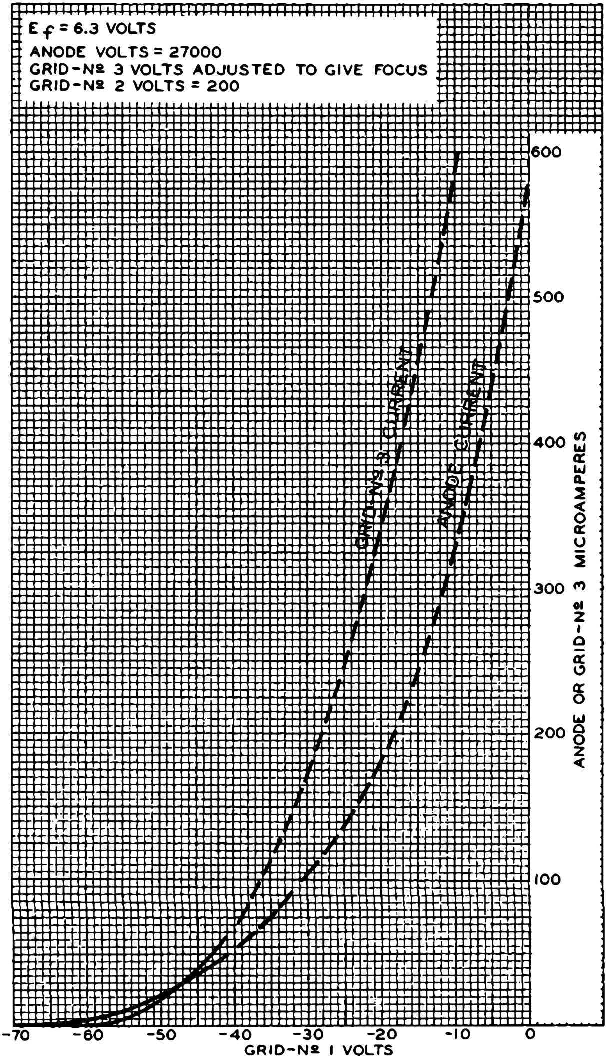
AVERAGE CHARACTERISTICS



5ZP16

5ZP16

AVERAGE CHARACTERISTICS



DEC. 26, 1950

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7576

RCA

7BP7-A
OSCILLOGRAPH TUBE

MAGNETIC FOCUS MAGNETIC DEFLECTION

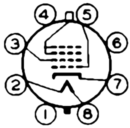
DATA

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.

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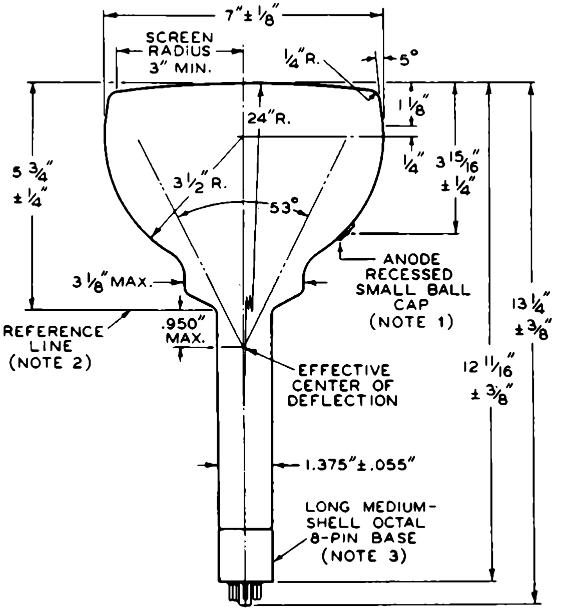
7BP7-A
OSCILLOGRAPH TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10°. ANODE TERMINAL IS ON SAME SIDE OF TUBE AS PIN No.5.

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

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

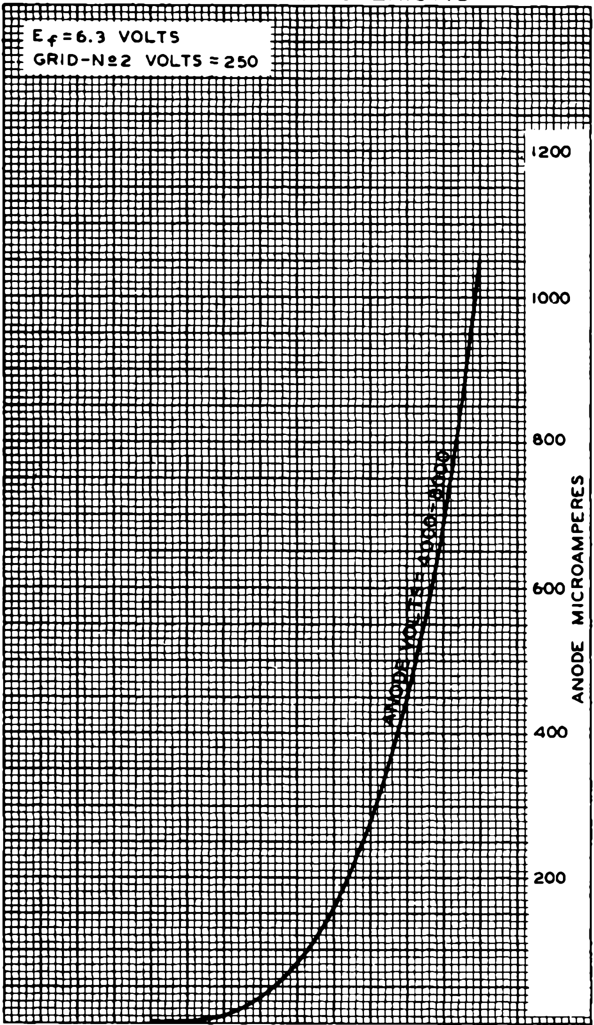
92CM-6367R3

7BP7-A

RCA

7BP7-A

AVERAGE CHARACTERISTIC



RCA

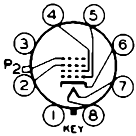
7CP1
OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS, MAGNETIC 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	μμf
Cathode to All Other Electrodes	6.5	μμf
Phosphor (For Curves, see front of this Section)		No.1
Fluorescence		Green
Persistence		Medium
Focusing Method		Electrostatic
Deflection Method		Magnetic
Solid Deflection Angle (Approx.)		57°
Overall Length		13-7/16" ±3/8"
Greatest Diameter of Bulb		7" ±1/8"
Minimum Useful Screen Diameter		6-1/2"
Cap		Recessed Small Ball
Mounting Position		Any
Base		Long Medium-Shell Octal 8-Pin
Basing Designation for BOTTOM VIEW		6AZ

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



Pin 6 - Cathode
Pin 7 - Heater
Pin 8 - Heater
Cap - Anode No.2

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

ANODE-No.2 VOLTAGE	8000 max.	volts
ANODE-No.1 VOLTAGE	2400 max.	volts
GRID-No.2 VOLTAGE	300 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias 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

Typical Operation:

Anode-No.2 Voltage*	4000	7000	volts
Anode-No.1 Voltage for Focus at 75% of Grid-No.1 Voltage for Cutoff°	780	1365	volts
Grid-No.2 Voltage	250	250	volts
Grid-No.1 Voltage for Visual Cutoff**	-45	-45	volts

*, °, **: See next page.

7CP1

OSCILLOGRAPH TUBE

* Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, the anode-No.2 voltage should not be less than 4000 volts.

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

** Visual extinction of undeflected focused spot. Supply should be adjustable to ±50% of indicated value.

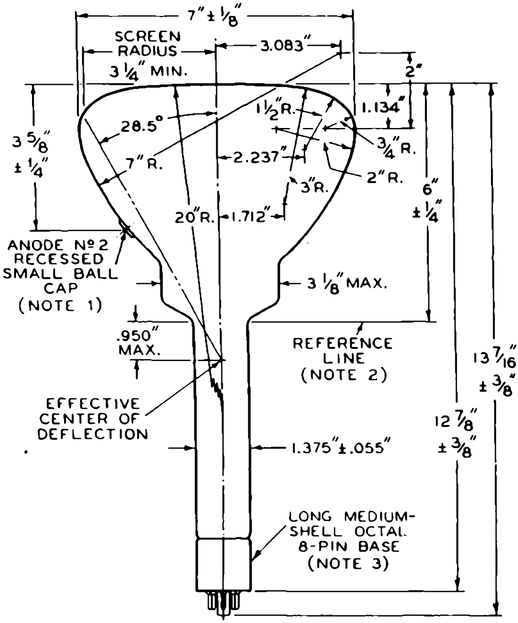
Maximum Circuit Values:

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

RCA

7CP1

OSCILLOGRAPH TUBE



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

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

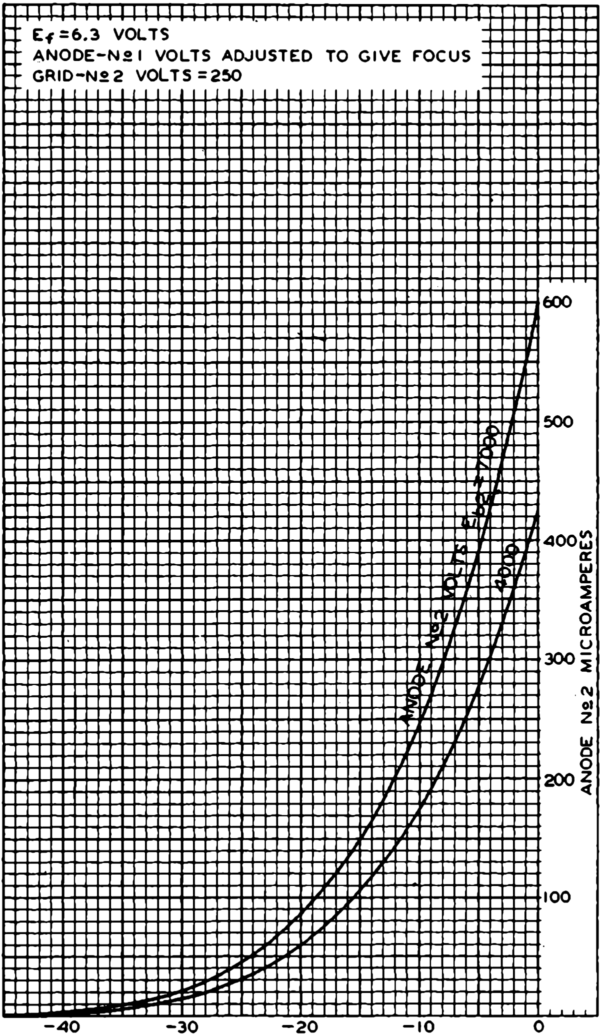
NOTE 3: ℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

92CM-6364R2

RCA

7CP1

AVERAGE CHARACTERISTICS



AUG. 23, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92C-6424

7DP4

KINESCOPE

ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6	amp

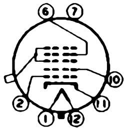
Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes	6	μμf ←
Cathode to All Other Electrodes	5	μμf
External Conductive Coating to Anode No.2	1500 max.	μμf
	400 min.	μμf

Phosphor (For Curves, see front of this Section) No.4
Fluorescence and Phosphorescence . . . . White
Persistence of Phosphorescence . . . . Medium
Focusing Method . . . . Electrostatic
Deflection Method . . . . Magnetic
Deflection Angle (Approx.) . . . . 50°
Ion Trap . . . . Magnetic
External Coating . . . . Conductive
Overall Length . . . . 14-1/16" ± 3/8"
Greatest Diameter of Bulb . . . . 7-3/16" ± 1/8"
Minimum Useful Screen Diameter . . . . 6"
Raster Size (Approx.) . . . . 4" x 5-1/2"
Mounting Position . . . . Any
Cap . . . . Recessed Small Cavity
Base . . . . Small-Shell Duodecal 7-Pin

BOTTOM VIEW

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



Pin 10 – Grid No.2
Pin 11 – Cathode
Pin 12 – Heater
Cap – Anode No.2, Grid No.3

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

ANODE-No.2■ VOLTAGE●	8000 max.	volts
ANODE-No.1 VOLTAGE	2400 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 (CONTROL ELECTRODE) 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 ←

■,●: See next page.
← Indicates a change.

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7DP4

7DP4
KINESCOPE

Typical Operation:

Anode-No.2 Voltage■	6000 . .	volts
Anode-No.1 Voltage for Focus○	1215 to 1645	volts
Grid-No.2 Voltage	250 . .	volts
Grid-No.1 Voltage for Visual Cutoff** .	-27 to -63	volts
Max. Anode-No.1 Current Range	-15 to +10	μamp

Maximum Circuit Values:

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

→**Minimum Circuit Values:**

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

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

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

Components:

Ion-Trap Magnet# . . . . RCA Type No.203D1

→Deflecting Yoke★ . . . . RCA Type No.201D12

■ Anode No.2 and grid No.3, which are connected together within tube, are referred to herein as anode No.2.

● The product of anode-No.2 voltage and average anode-No.2 current should never exceed 6 watts.

■ Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 5000 volts.

○ With the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 12 foot-lamberts on a 4" x 5-1/2" picture area.

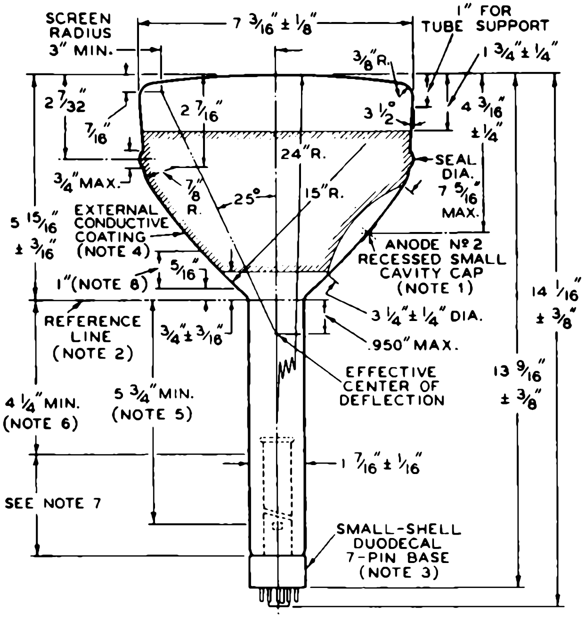
** Visual extinction of undeflected focused spot.

The dc current required by this magnet is approx. 70 ma. for the typical operating conditions shown.

★ The horizontal deflecting-coil current required by this yoke to produce 5-1/2" picture width is approx. 410 ma. peak-to-peak under the typical operating conditions shown. The current varies directly as the square root of the anode-No.2 voltage.

→Indicates a change.

7DP4
KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No. 3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE No. 2 TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10°. ANODE No. 2 TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No. 3.

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

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

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: DISTANCE TO INTERNAL POLE PIECES. PLANE THROUGH

7DP4
KINESCOPE

(continued from preceding page)

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

NOTE 6: LOCATION OF DEFLECTING YOKE MUST BE WITHIN THIS SPACE.

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

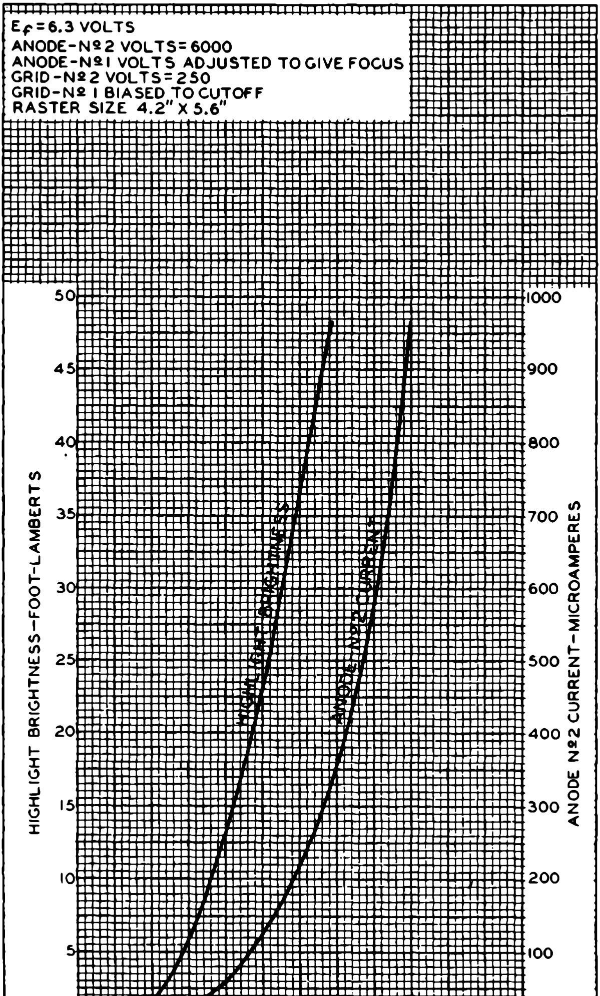
NOTE 8: FOR TUBE SUPPORT WHICH MUST NOT COVER SPECIFIED CLEAR AREA AROUND ANODE CAP.

92CM-6664R1

RCA

7DP4

AVERAGE CHARACTERISTICS



OCT. 14, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6674R1

7JP1

OSCILLOGRAPH TUBE

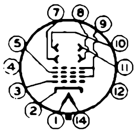
ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

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	$\mu\mu f$
DJ_1 to DJ_2	3	$\mu\mu f$
DJ_3 to DJ_4	2	$\mu\mu f$
DJ_1 to All Other Electrodes	9	$\mu\mu f$
DJ_2 to All Other Electrodes	9	$\mu\mu f$
DJ_3 to All Other Electrodes	7	$\mu\mu f$
DJ_4 to All Other Electrodes	7	$\mu\mu f$
Phosphor (For Curves, see front of this Section)		No. 1
Fluorescence and Phosphorescence		Green
Persistence of Phosphorescence		Medium
Focusing Method		Electrostatic
Deflection Method		Electrostatic
Deflecting-Electrode Arrangement		See Outline Drawing
Overall Length		14-1/2" ± 3/8"
Greatest Diameter of Bulb		7" ± 1/8"
Minimum Useful Screen Diameter		6"
Mounting Position		Any
Base		Medium-Shell Diheptal 12-Pin
Basing Designation for BOTTOM VIEW		$14G_1$

Pin 1 - Heater
Pin 2 - Cathode
Pin 3 - Grid No.1
Pin 4 - No Connection
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 - 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 $90^\circ \pm 3^\circ$.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7JPI

7JPI

OSCILLOGRAPH TUBE

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

ANODE-No.2● VOLTAGE□	6000 max.	volts
ANODE-No.1 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 ANODE No.2 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 anode-No.2 voltage (E_{b_2}) between 1000 and 6000 volts*

Anode-No.1 Voltage	27% to 40% of E_{b2}	volts
Max. Grid-No.1 Voltage for Visual Cutoff . .	2.8% of E_{b2}	volts
Anode-No.1 Current for any Operating Condition.	-15 to +10 . . .	microamp
Deflection Factors:		
DJ_1 & DJ_2.	31 to 41	v dc/in./kv of E_{b2}
DJ_3 & DJ_4.	25 to 34	v dc/in./kv of E_{b2}
Spot Position.	#	

Examples of Use of Design Ranges:

For anode-No.2 voltage of	*2000*	*4000*	*volts*
Anode-No.1 Voltage	540-800	1080-1600	. . . volts
Max. Grid-No.1 Voltage for Visual Cutoff . .	-56	-112	. . . volts
Deflection Factors:			
DJ_1 & DJ_2.	62-82	124-164	volts dc/in.
DJ_3 & DJ_4.	50-68	100-136	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

Minimum Circuit Values:

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

Grid-No.1-Circuit Resistance	220 min.	ohms

●,□,*,#,○: see next page.

7JPI

OSCILLOGRAPH TUBE

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

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

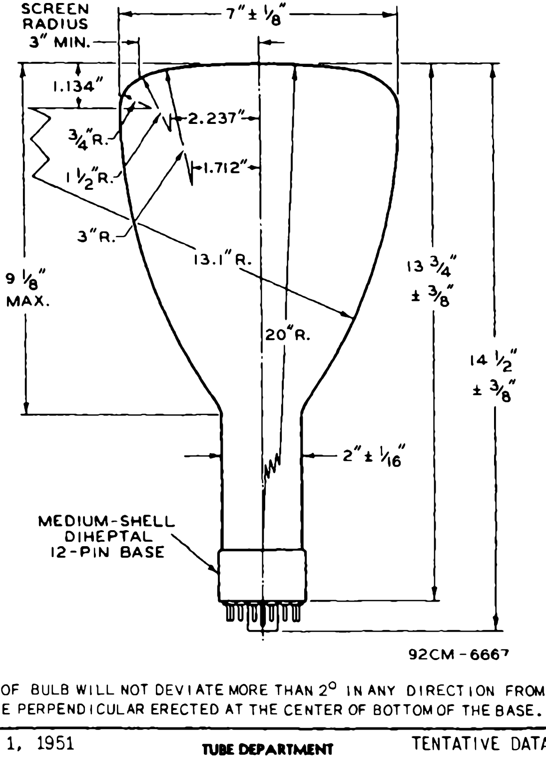
● Anode No. 2 and grid No. 2, which are connected together within tube, are referred to herein as anode No. 2.

□ For operation at or near 0 volts on grid No. 1 and with 4000 to 6000 volts on anode No. 2, it is essential that the effective resistance of the anode-No. 2 supply be adequate to limit the anode-No. 2 input power to 6 watts.

* Brilliance and definition decrease with decreasing anode-No. 2 voltage. A value as low as 1000 volts is recommended only for low-velocity deflection and low ambient-light levels.

The center of the undeflected, focused spot will fall within a circle having a 10-mm radius concentric with the center of the tube face.

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



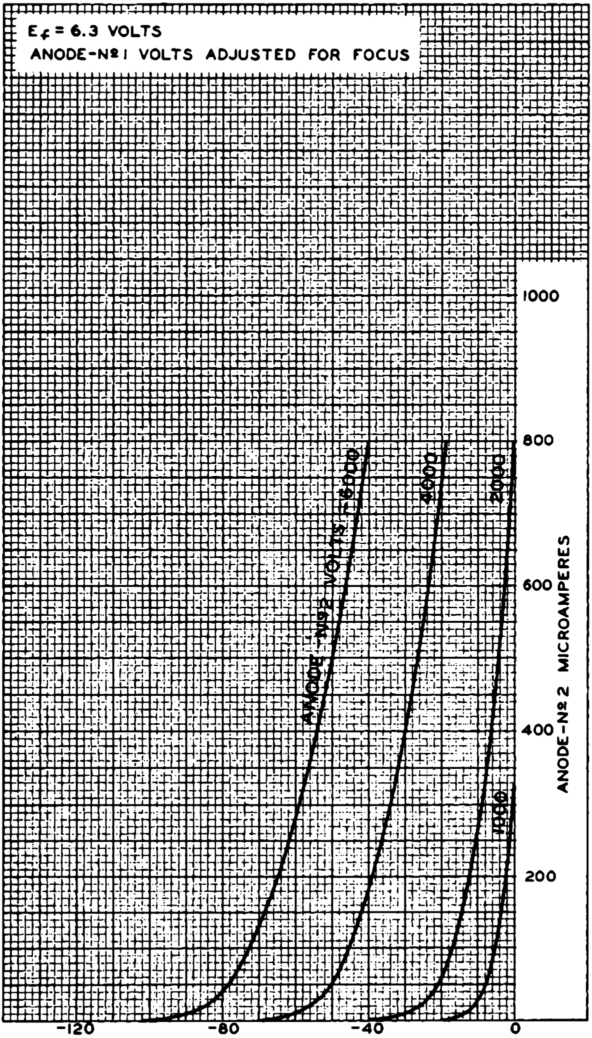
92CM-6667

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

RCA

7JP1

AVERAGE CHARACTERISTICS



AUGUST 4, 1950

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7521

RCA

7JP4
KINESCOPE

ELECTROSTATIC FOCUS--ELECTROSTATIC DEFLECTION

*Supersedes Type 7GP4**

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	9.5	μμf
DJ_1 to DJ_2	3.5	μμf
DJ_3 to DJ_4	2.0	μμf
DJ_1 to All Other Electrodes	11.0	μμf
DJ_2 to All Other Electrodes	11.0	μμf
DJ_3 to All Other Electrodes	8.0	μμf
DJ_4 to All Other Electrodes	8.0	μμf

Phosphor (For Curves, see front of this Section) No.4
- Fluorescence . . . . White
- Persistence . . . . Medium

Focusing Method . . . . Electrostatic

Deflection Method . . . . Electrostatic

Overall Length . . . . 14-1/2" ± 3/8"

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

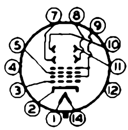
Minimum Useful Screen Diameter . . . . 6"

Raster Size . . . . 4" x 5-1/2"

Mounting Position . . . . Any

Base . . . . Medium-Shell Diheptal 12-Pin
- Basing Designation for BOTTOM VIEW 14-G

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

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

* The 7JP4 replaces the 7GP4 provided no connections are made to the 7GP4 socket contacts for pins 4 and 12.

7JP4
KINESCOPE

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

ANODE-No.2 & GRID-No.2 VOLTAGE	6000 max.	volts
ANODE-No.1 VOLTAGE	2800 max.	volts
GRID-No.1 (CONTROL ELECTRODE) 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. . .	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

Equipment Design Ranges:

For any anode-No.2 voltage (E_{b2}) between 3000* and 6000 volts

Anode-No.1 Voltage for Focus□	27% to 40% of E_{b2} . . .	volts
Grid-No.1 Voltage for Visual Cutoff	1.2% to 2.8% of E_{b2} . . .	volts
Anode-No.1 Current for Any Operating Condition	-15 to +10 . . .	μamp
Deflection Factors:		
DJ_1 & DJ_2	31 to 41	v dc/in./kv of E_{b2}
DJ_3 & DJ_4 ⊕	25 to 34	v dc/in./kv of E_{b2}

Examples of Use of Design Ranges:

For anode-No.2 voltage of 6000 volts

Anode-No.1 Voltage	1620 to 2400 . . .	volts
Grid-No.1 Voltage for Visual Cutoff	-72 to -168 . . .	volts
Deflection Factors:		
DJ_1 & DJ_2	186 to 246	volts dc/in.
DJ_3 & DJ_4	150 to 204	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

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

#,*,□,○,⊕: See next page.

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7JP4
KINESCOPE

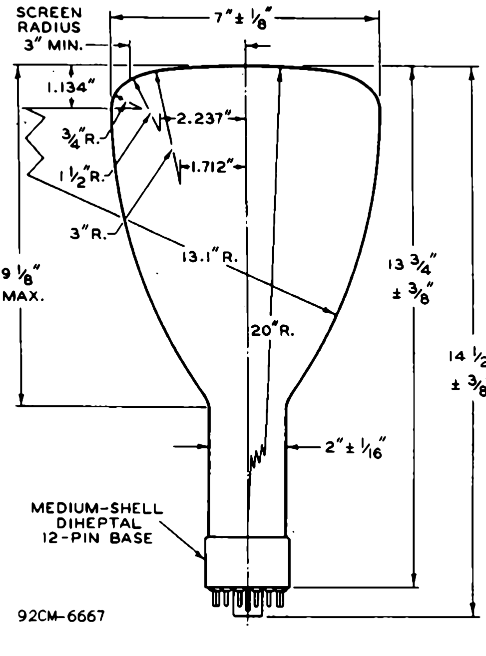
At or near this rating, with 4000 to 6000 volts on anode No. 2, the effective resistance of the anode-No. 2 supply should be adequate to limit the anode-No. 2 input power to 6 watts.

• Brilliance and definition decrease with decreasing anode-No. 2 voltage.

□ With the combined grid-No. 1 bias voltage and video-signal voltage adjusted for a highlight brightness of 12 foot-lamberts on a 4" x 5-1/2" picture area.

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

⊕ The 7JP4 is designed to be used in television circuits with horizontal deflection applied to deflecting electrodes DJ_3 and DJ_4, and should be so used to obtain maximum picture width. When the 7JP4 is operated in this way, the deflecting voltage required to produce the vertical height is approximately the same as that required to produce the horizontal width of a television picture of standard proportions.

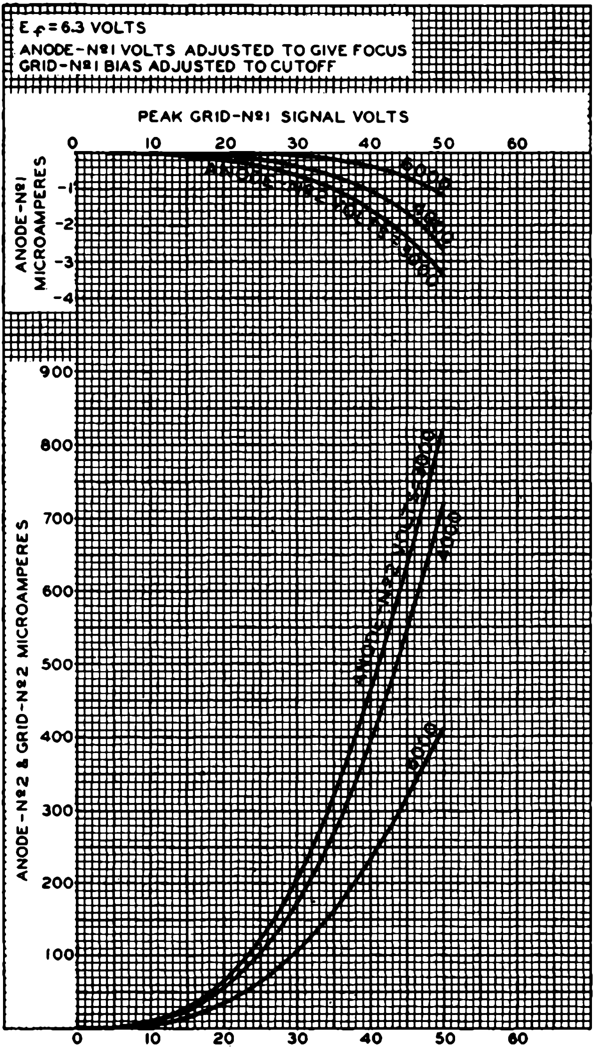


℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

RCA

7JP4

OPERATION CHARACTERISTICS



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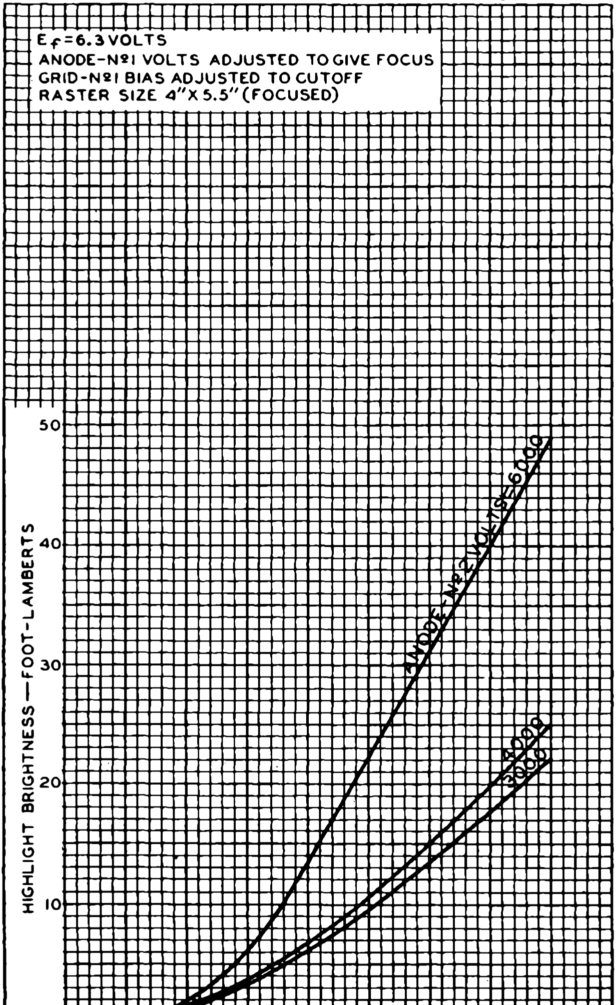
7JP4

OPERATION CHARACTERISTICS



7MP7

RCA

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 $\mu\mu$f
- Cathode to All Other Electrodes . . . . 5 $\mu\mu$f

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"

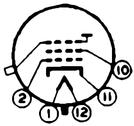
Mounting Position . . . . Any

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 resnect 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.

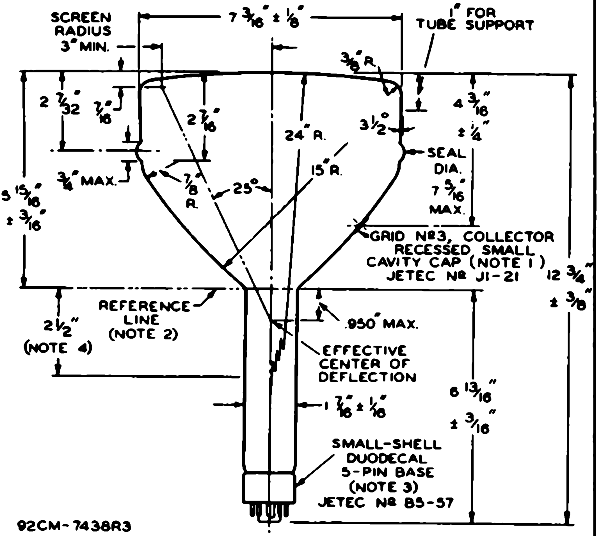
** For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward faceplate and center line of air gap 2-3/4" from Reference Line (see Outline Drawing) and ultor current of 200 microamperes.

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

7MP7

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.

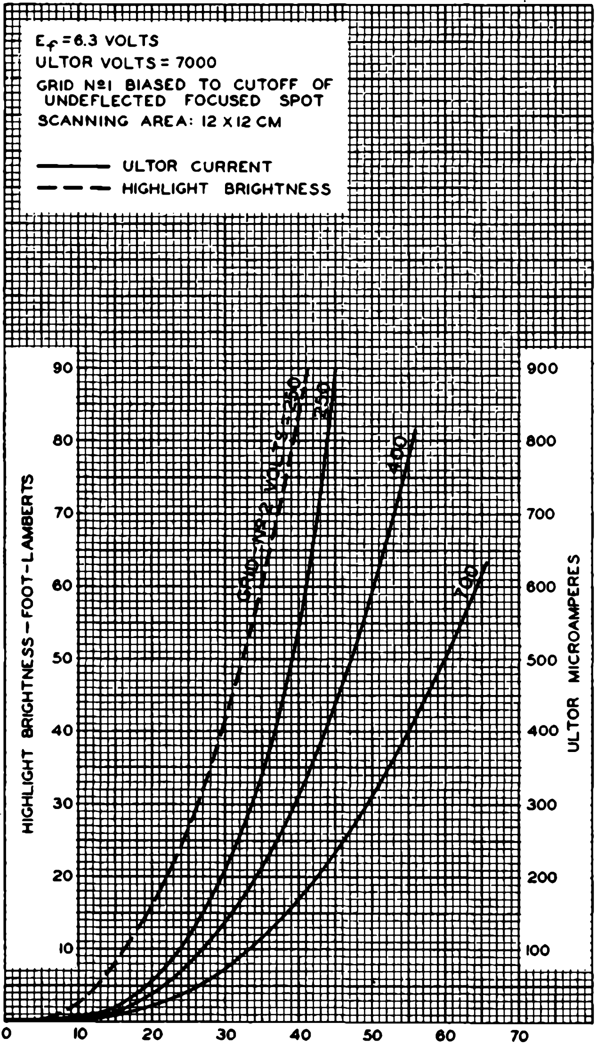
NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED: IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF 1-7/8".

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

7MP7

7MP7

AVERAGE GRID-DRIVE CHARACTERISTICS



7MP14
OSCILLOGRAPH TUBE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

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

Because of its medium-long-persistence, the 7MP14 is particularly useful where either low- and medium-speed non-recurring phenomena or high-speed recurring phenomena are to be observed. Furthermore, two or more phenomena can be observed simultaneously on the screen by means of a suitable switching arrangement.

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

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

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

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7NP4

7NP4

PROJECTION KINESCOPE

METAL-BACKED FLUORESCENT SCREEN
FORCED-AIR COOLED

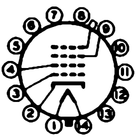
ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
Voltage. . . . . 6.6 . . . . . . ac or dc volts ←
Current. . . . . 0.62 . . . . amp
Direct Interelectrode Capacitances (Approx.):
Grid No.1 to All Other Electrodes. . . . . 12 $\mu\mu$f
Cathode to All Other Electrodes. . . . . . 6 $\mu\mu$f
Phosphor (For Curves, see front of this Section) . . No.4—Silicate-Sulfide Type
Fluorescence and Phosphorescence . . . . White
Persistence of Phosphorescence . . . . Medium
Focusing Method. . . . . Electrostatic
Deflection Method. . . . . Magnetic
Deflection Angle (Approx.) . . . . 35°
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 Face Plate (See Outline Drawing). . . . . 5" x 3-3/4"
Cap. . . . . Medium
Mounting Position. . . . . Any
Base . . . . . . Plastic-Filled, Small-Shell Diheptal 14-Pin
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 Conn.
Pin 6 - No Conn.
Pin 7 - No Conn.
Pin 8 - No Conn.



Pin 9 - Grid No.3
Pin 10 - No Conn.
Pin 11 - No Conn.
Pin 12 - No Conn.
Pin 13 - Int. Conn.- Do Not Use
Pin 14 - Heater
Cap - Anode

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

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. $^{\circ}$C

CATHODE-DRIVE* SERVICE

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

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

ANODE-to-GRID-No.1 VOLTAGE°. . . . . 80000 max. volts

*,°: See next page ← Indicates a change

RCA

7NP4

PROJECTION KINESCOPE

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 ANODE 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

Typical Operation:

Anode-to-Grid-No.1 Voltage#.	75000	volts
Grid-No.3-to-Grid-No.1 Voltage	16000 - 18000	volts
Grid-No.2-to-Grid-No.1 Voltage for Pattern Cutoff. . .	400 - 600	volts
Cathode-to-Grid-No.1 Voltage	125	volts
Cathode-to-Grid-No.1 Video Voltage:		
Peak positive value (Black level). .	0	volts
Peak negative value (White Level). .	125	volts
Max. Grid-No.3 Current	15	μamp
Max. Grid-No.2 Current Range	-15 to +15	μamp

GRID-DRIVE** SERVICE

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

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

ANODE 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 ANODE 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

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

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

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

#: See next page.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7NP4

7NP4

PROJECTION KINESCOPE

Typical Operation:

Anode Voltage#	75000	volts
Grid-No.3 Voltage.	16000 - 18000	volts
Grid-No.2 Voltage for Pattern Cutoff .	400 - 600	volts
Grid-No.1 Voltage.	-155	volts
Grid-No.1 Video Voltage:		
Peak negative value (Black level). .	0	volts
Peak positive value (White level). .	155	volts
Max. Grid-No.3 Current	15	μamp
Max. Grid-No.2 Current Range	-15 to +15	μamp

Maximum Circuit Values:

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

\# Brilliance and definition decrease with decreasing anode-to-grid-No.1 voltage or anode voltage. In general, the anode-to-grid-No.1 voltage or the anode voltage should not be less than 70000 volts.

OPERATING NOTES

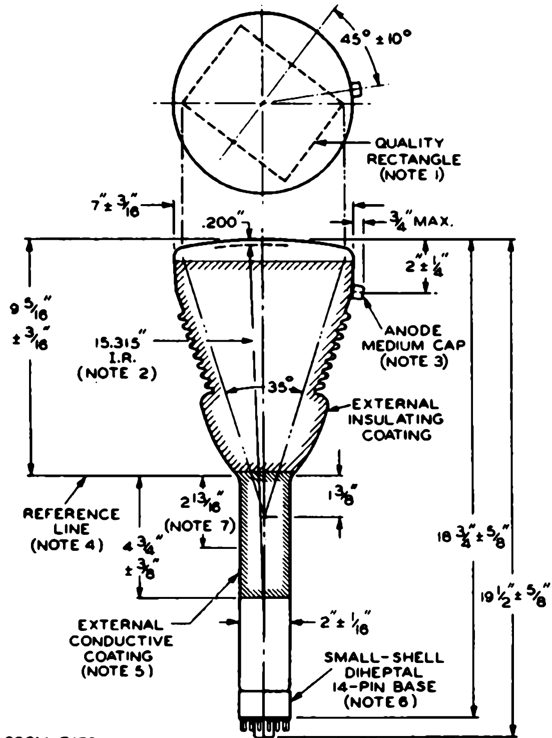
X-ray radiation is produced at the face of the 7NP4 when it is operated at its normal anode voltage. These rays can constitute a health hazard unless the tube is adequately shielded. Make sure that the shielding provides the required protection against personal injury.

The air-cooling system required to cool the face of the 7NP4 consists of a blower 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 anode power supply to prevent operation of the tube without cooling.

Darkening of face occurs during normal operation of the 7NP4 with resulting decrease in the light transmitted by the face. The rate of darkening increases rapidly with increase in anode voltage, is proportional to the beam current, and is inversely proportional to the scanned area. The darkening develops rapidly during initial operation; thereafter, a gradual increase in the amount of darkening will be observed during the life of the tube. The darkening, however, can be decreased periodically throughout the life of the tube by bleaching the face as prescribed in the 7NP4 bulletin.

RCA

7NP4
PROJECTION KINESCOPE



92CM-7476

NOTE 1: WHEN VIEWED FROM THE FACE OF THE TUBE, THE MINOR AXIS OF THE 5" x 3-3/4" QUALITY RECTANGLE IS LOCATED 45° ± 10° IN A COUNTER-CLOCKWISE DIRECTION FROM A PLANE THROUGH THE ANODE TERMINAL AND THE TUBE AXIS.

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

NOTE 3: THE PLANE THROUGH BASE PIN No.9 AND THE TUBE AXIS MAY VARY FROM THE PLANE THROUGH THE ANODE TERMINAL AND THE TUBE AXIS BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10°. THE ANODE TERMINAL IS ON SAME SIDE AS PIN No.9.

7NP4
PROJECTION KINESCOPE

NOTE 4: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 2.100" ± .001" I.D. AND 3" LONG WILL REST ON BULB CONE.

NOTE 5: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

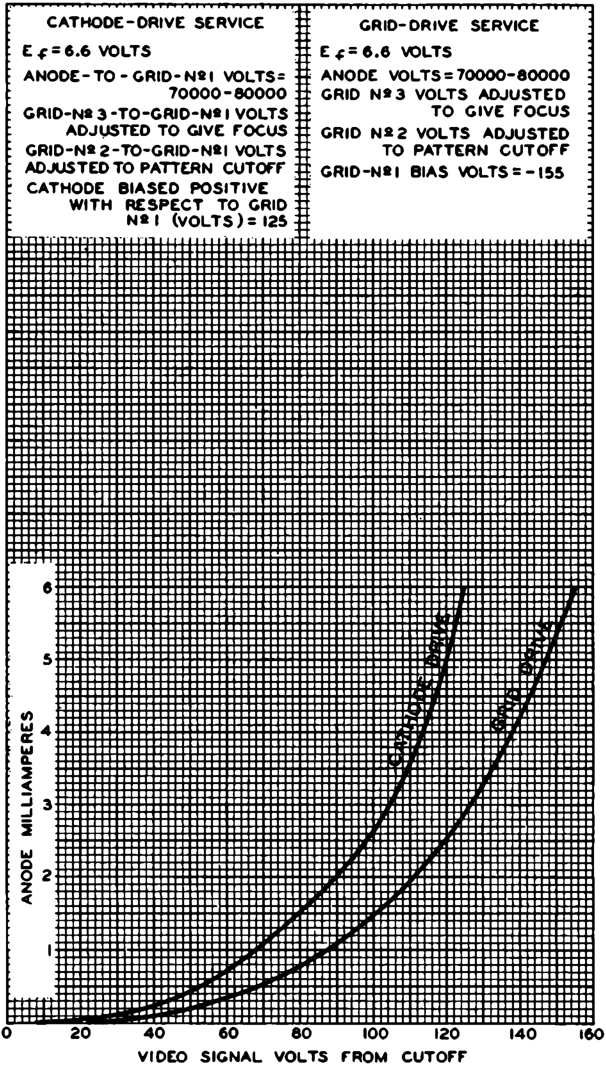
NOTE 6: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. SOCKET CONTACTS FOR PINS 5, 6, 7, 8, 10, 11, 12, AND 13 SHOULD BE REMOVED IN ORDER TO PROVIDE MAXIMUM INSULATION FOR PIN No.9.

NOTE 7: EFFECTIVE DEFLECTING FIELD MUST BE WITHIN THIS SPACE.

7NP4

7NP4

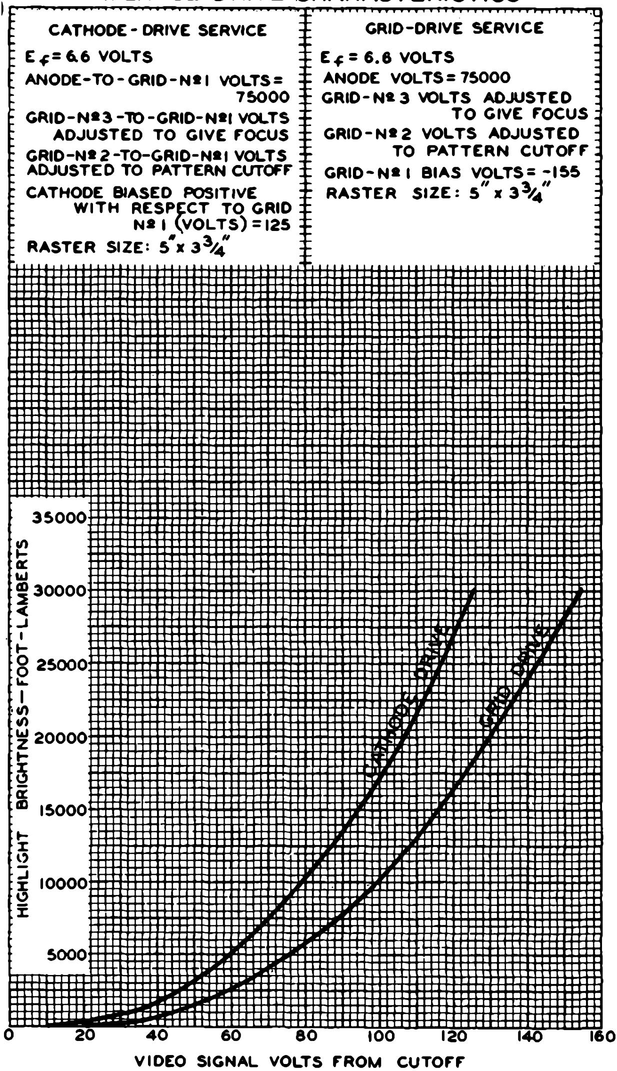
AVERAGE DRIVE CHARACTERISTICS



RCA

7NP4

AVERAGE DRIVE CHARACTERISTICS



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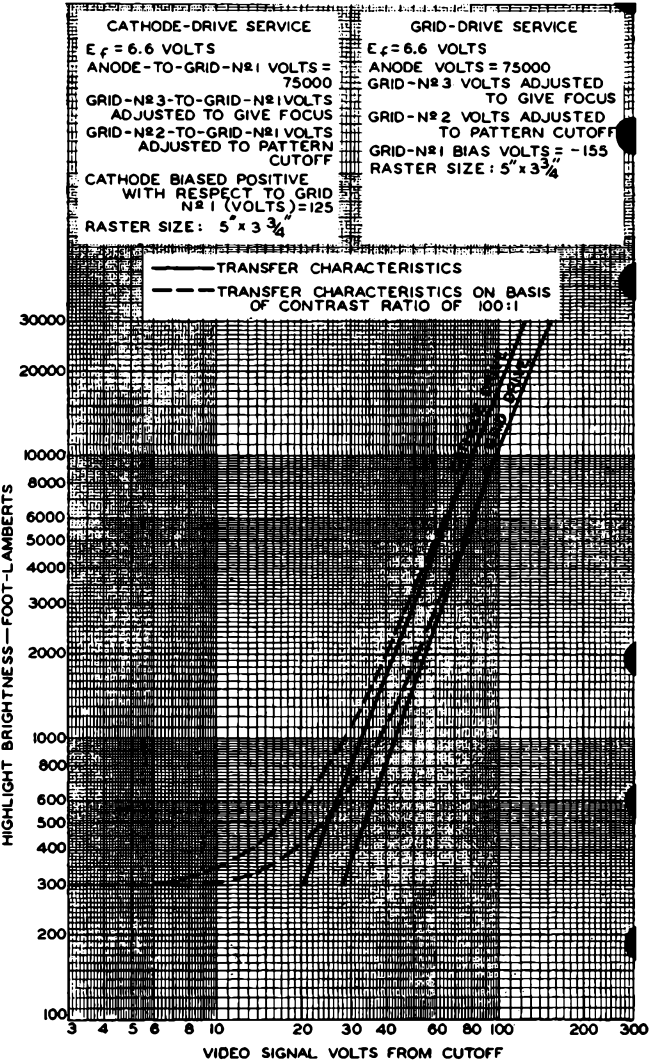
7NP4

AVERAGE DRIVE CHARACTERISTICS



JULY 28, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-7519

7QP4

RCA 7QP4

MONITOR KINESCOPE

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 . . . $\mu\mu$f
- Cathode to All Other Electrodes . . . . . . 5 . . . $\mu\mu$f

Phosphor (For Curves, See front of this Section). No.4-Sulfide Type
- Fluorescence . . . . White
- Phosphorescence . . . . White
  - Persistence . . . . Short

Focusing Method . . . . Magnetic

Deflection Method . . . . Magnetic

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

Ion-Trap Gun . . . . . Requires External, Single-Field Magnet

Overall Length . . . . 12-7/8" ± 3/8"

Greatest Diameter of Bulb . . . . 7-3/16" ± 1/8"

Screen Diameter . . . . 6-1/4"

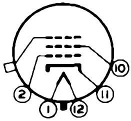
Mounting Position . . . . Any

Cap . . . . Recessed Small Cavity

Base . . . . Small-Shell Duodecal 5-Pin

BOTTOM VIEW

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



Pin 11 - Cathode
Pin 12 - Heater
Cap - Anode

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

ANODE VOLTAGE*	10000 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

Typical Operation:

Anode Voltage**	8000 . .	volts

* The product of anode voltage and average anode current should be limited to 6 watts.

** Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 6000 volts.

7QP4

MONITOR KINESCOPE

Grid-No.2 Voltage.	300	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot . .	-33 to -77	volts
Focusing-Coil Current (DC, approx.)# . . .	80	ma
Field Strength of Single-Field Ion-Trap Magnet°.	35	gausses

Maximum Circuit Values:

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

Minimum Circuit Values:

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

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

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

\# For specimen focusing coil similar to JETEC Focusing Coil No.109, positioned with air gap toward kinescope screen, and center line of air gap 3 inches from Reference Line (see *Outline Drawing*). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 40 foot-lamberts on a 5-3/8" x 4" picture area sharply focused at center of screen.

° Measured at center of field with General Electric Gauss Meter, Cat. No.409X51.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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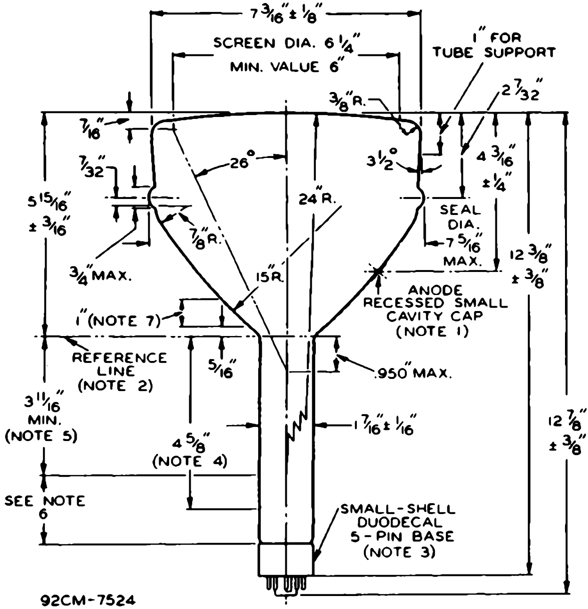
7QP4

MONITOR KINESCOPE



92CM-7524

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

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + .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: DISTANCE FROM REFERENCE LINE FOR LOCATING CENTER OF ION-TRAP MAGNETIC FIELD. DIRECTION OF FIELD OF THE ION-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO VACANT PIN POSITION No.8 AND SOUTH POLE TO PIN No.2.

7QP4

MONITOR KINESCOPE

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

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

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

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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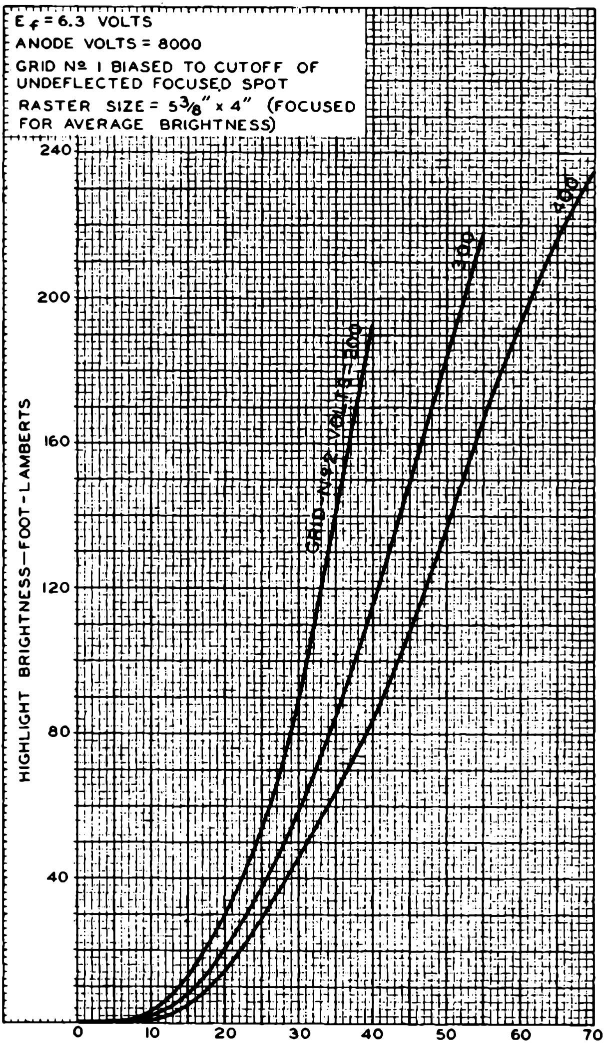
7QP4

AVERAGE GRID-DRIVE CHARACTERISTICS



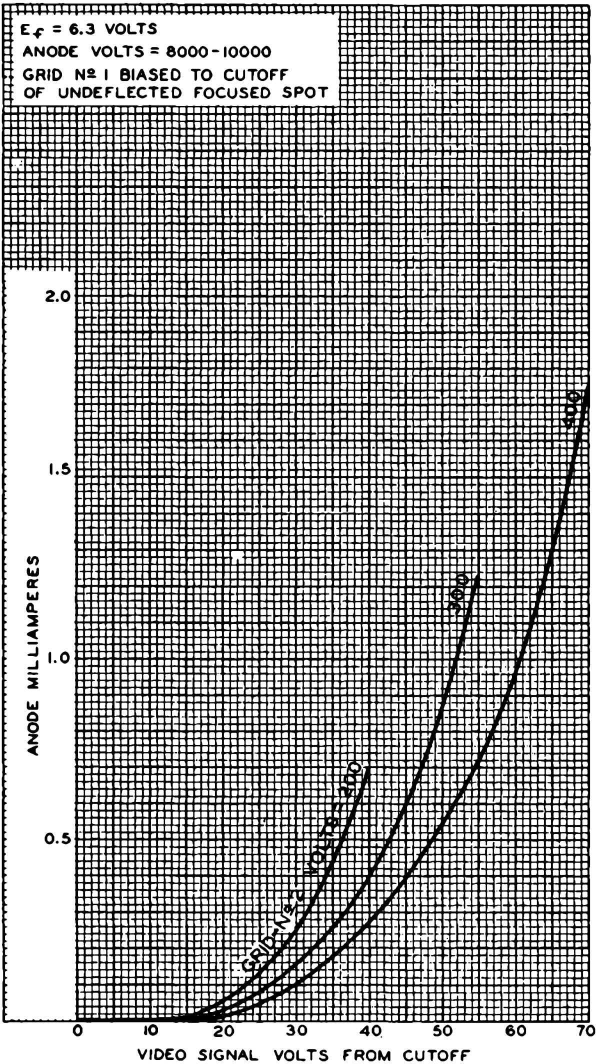
AUGUST 22, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7529

7QP4

AVERAGE GRID-DRIVE CHARACTERISTICS



7TP4

7TP4
MONITOR KINESCOPE

METAL-BACKED SCREEN

ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, *for Unipotential Cathode:*

Voltage	6.3	ac or dc volts
Current	0.6	amp

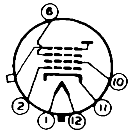
Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes	6	$\mu\mu f$
Cathode to All Other Electrodes	5	$\mu\mu f$

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.

FEB. 1, 1952 — TENTATIVE DATA

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

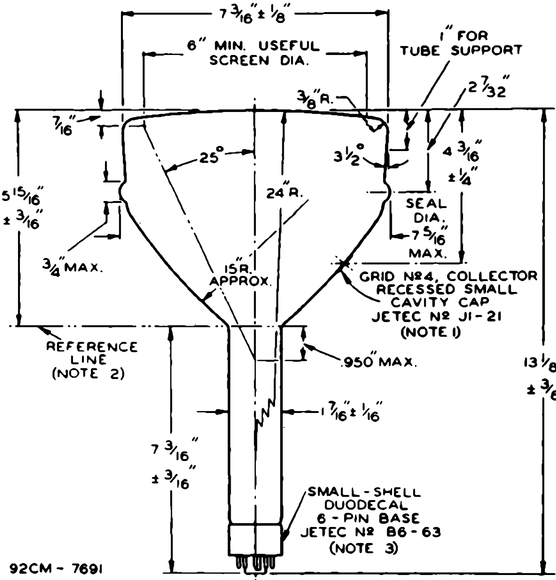
* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 10000 volts.

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

7TP4

7TP4

MONITOR KINESCOPE



92CM-7691

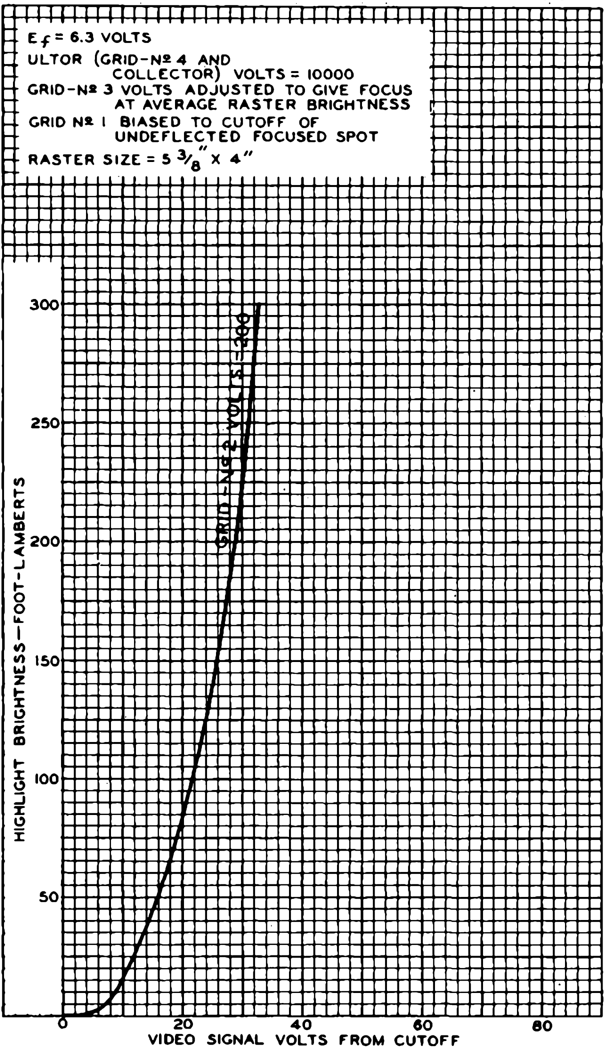
NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND BULB TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS OF ± 10°. BULB TERMINAL IS ON SAME SIDE AS PIN No.6.

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".

7TP4

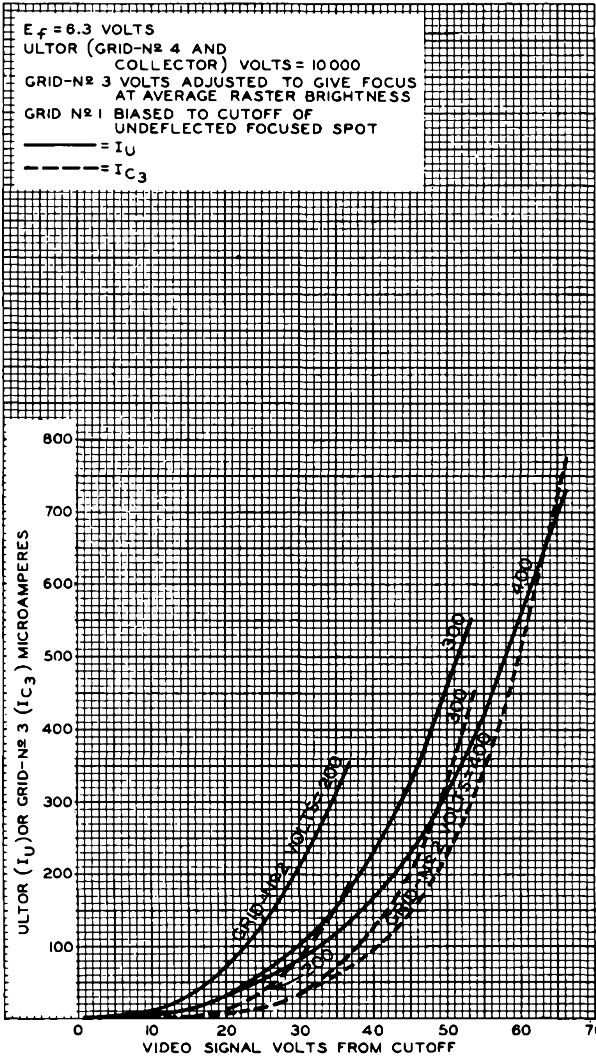
AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

7TP4

AVERAGE GRID-DRIVE CHARACTERISTICS



7VP1

7VP1

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6	amp

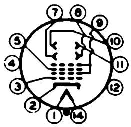
Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes	6	$\mu\mu$f
DJ_1 to DJ_2	3	$\mu\mu$f
DJ_3 to DJ_4	2	$\mu\mu$f
DJ_1 to All Other Electrodes	9	$\mu\mu$f
DJ_2 to All Other Electrodes	9	$\mu\mu$f
DJ_3 to All Other Electrodes	7	$\mu\mu$f
DJ_4 to All Other Electrodes	7	$\mu\mu$f

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.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7VP1

RCA

7VP1

OSCILLOGRAPH TUBE

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

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

Equipment Design Ranges:

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

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

Examples of Use of Design Ranges:

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

Maximum Circuit Values:

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

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

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

#,##,°: See next page.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

7VP1

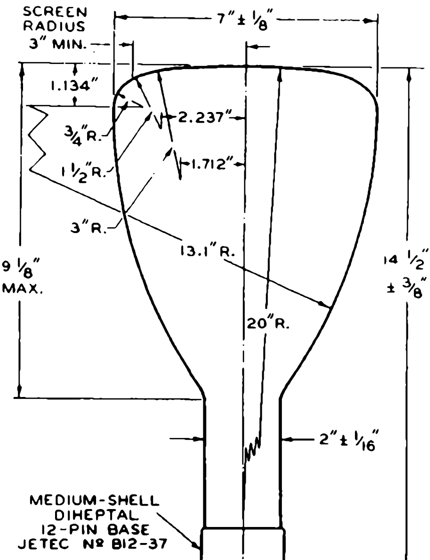
OSCILLOGRAPH TUBE

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

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

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.

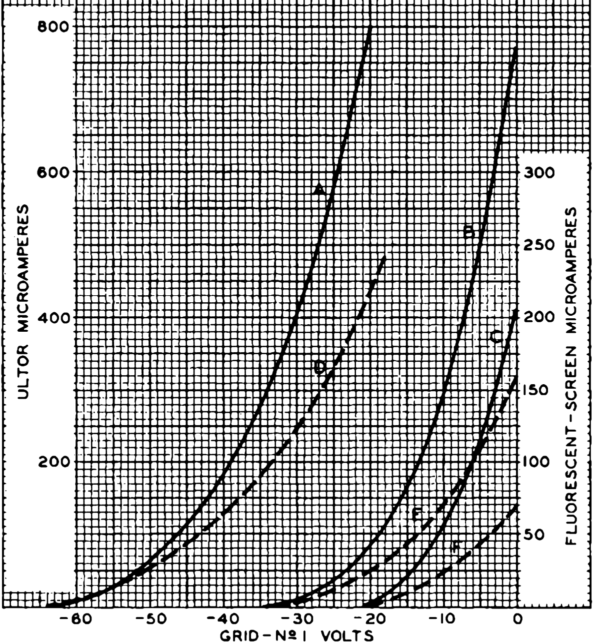
7VP1

7VP1

AVERAGE CHARACTERISTICS

E_f = 6.3 VOLTS
GRID-No3 VOLTS ADJUSTED FOR FOCUS

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



7WP4

7WP4

PROJECTION KINESCOPE

METAL-BACKED FLUORESCENT SCREEN

FORCED-AIR COOLED

ELECTROSTATIC FOCUS   MAGNETIC DEFLECTION

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

Focusing Method . . . . Electrostatic

Deflection Method . . . . Magnetic

Deflection Angle (Approx.) . . . . 35^{o}

Overall Length . . . . 19-7/16" ± 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 Outline Drawing) . . . . 5" x 3-3/4"

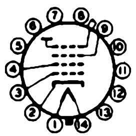
Refractive Index for Faceplate Glass 1.469

Cap . . . . Medium (JETEC No.C1-5)

Mounting Position . . . . Any

Base . . . . . Plastic-Filled, Small-Shell Diheptal 14-Pin (JETEC No.B14-45)

BOTTOM VIEW



Pin 1 - Heater
Pin 2 - Cathode
Pin 3 - Grid No.1
Pin 4 - Grid No.2
Pin 5 - No Conn.
Pin 6 - No Conn.
Pin 7 - No Conn.
Pin 8 - No Conn.
Pin 9 - Grid No.3
Pin 10 - No Conn.
Pin 11 - No Conn.
Pin 12 - No Conn.
Pin 13 - Int. Conn.- Do Not Use
Pin 14 - Heater
Cap - Ultor (Grid No.4, Collector)

NOTE: Socket Contacts for pins No.5, 6, 7, 8, 10, 11, 12, and 13 should be removed so that maximum insulation is provided for pin No.9.

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

RCA

7WP4

PROJECTION KINESCOPE

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

Typical Operation:

Ultor-to-Grid-No.1 Voltage#	75000	volts
Grid-No.3-to-Grid-No.1 Voltage	16000 – 18000	volts
Grid-No.2-to-Grid-No.1 Voltage for Pattern Cutoff . .	400 – 600	volts
Cathode-to-Grid-No.1 Voltage	125	volts
Cathode-to-Grid-No.1 Video Voltage:		
Peak positive value (Black level). .	0	volts
Peak negative value (White level). .	125	volts
Max. Grid-No.3 Current	15	μamp
Max. Grid-No.2 Current Range	–15 to +15	μamp

GRID-DRIVE** SERVICE

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

Maximum Ratings, *Absolute Values*:

ULTOR● VOLTAGE○	80000 max.	volts

● In the 7WP4, 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.

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

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

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

See next page.

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PROJECTION KINESCOPE

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

Typical Operation:

Ultor Voltage#	75000	volts
Grid-No.3 Voltage	16000 – 18000	volts
Grid-No.2 Voltage for Pattern Cutoff	400 – 600	volts
Grid-No.1 Voltage	-155	volts
Grid-No.1 Video Voltage:		
Peak negative value (Black level)	0	volts
Peak positive value (White level)	155	volts
Max. Grid-No.3 Current	15	μamp
Max. Grid-No.2 Current Range	-15 to +15	μamp

Maximum Circuit Values:

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

\# 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 70000 volts.

OPERATING NOTES

X-ray radiation is produced at the face of the 7WP4 when it is operated at its normal ultor voltage. For x-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section.

The air-cooling system required to cool the face of the 7WP4 consists of a blower 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.

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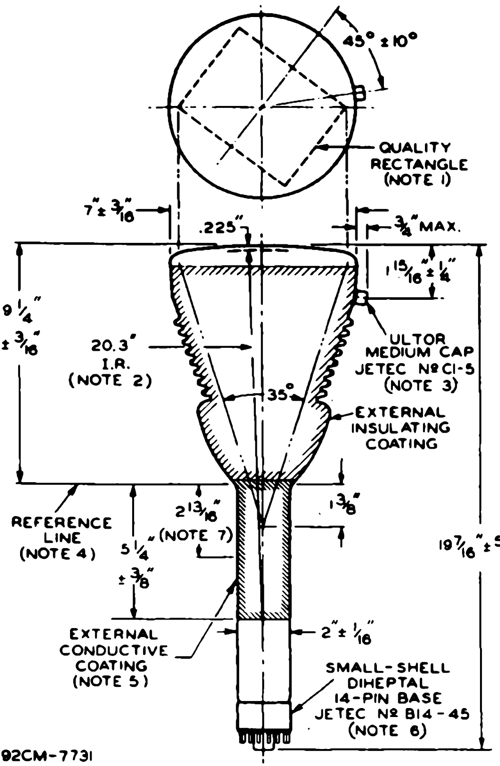
7WP4

PROJECTION KINESCOPE

OPERATING NOTES (Cont'd)

Darkening of face occurs during normal operation of the 7WP4 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. The darkening, however, can be decreased periodically throughout the life of the tube by bleaching the face as prescribed in the bulletin.



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7WP4

PROJECTION KINESCOPE

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

NOTE 2: INSIDE SURFACE OF FACEPLATE WITHIN THE QUALITY RECTANGLE MAY VARY ± 0.006" FROM THE SPHERICAL SURFACE HAVING A 20.3" RADIUS.

NOTE 3: THE PLANE THROUGH BASE PIN No.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 No.9.

NOTE 4: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 2.100" ± 0.001" I.D. AND 3" LONG WILL REST ON BULB CONE.

NOTE 5: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 6: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. SOCKET CONTACTS FOR PINS 6, 7, 8, 10, 11, 12, AND 13 SHOULD BE REMOVED IN ORDER TO PROVIDE MAXIMUM INSULATION FOR PIN No.9.

NOTE 7: EFFECTIVE DEFLECTING FIELD MUST BE WITHIN THIS SPACE.

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AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE

E_f = 6.6 VOLTS

ULTOR-TO-GRID-Nº1 VOLTS= 70000-80000

GRID-Nº3-TO-GRID-Nº1 VOLTS ADJUSTED TO GIVE FOCUS

GRID-Nº2-TO-GRID-Nº1 VOLTS ADJUSTED TO PATTERN CUTOFF

CATHODE BIASED POSITIVE WITH RESPECT TO GRID Nº1 (VOLTS) = 125

GRID-DRIVE SERVICE

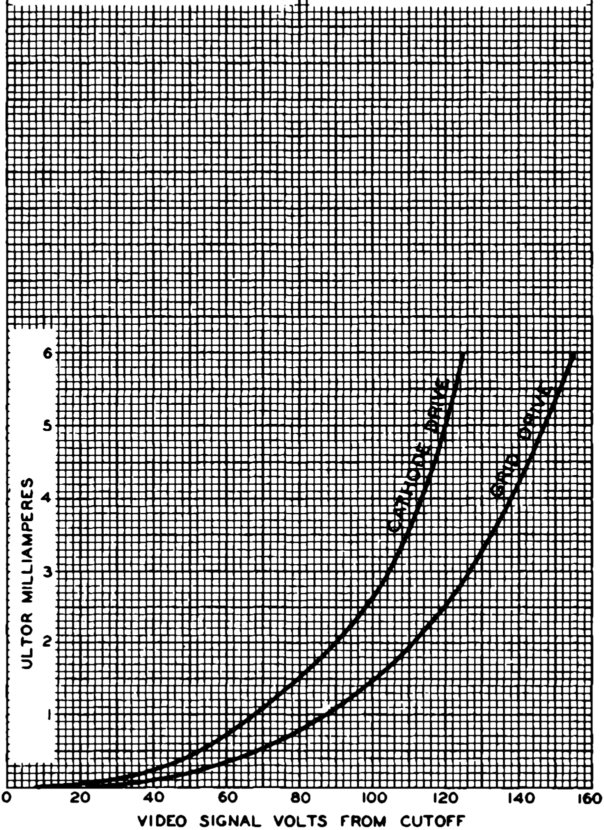
E_f = 6.6 VOLTS

ULTOR VOLTS=70000-80000

GRID Nº3 VOLTS ADJUSTED TO GIVE FOCUS

GRID Nº2 VOLTS ADJUSTED TO PATTERN CUTOFF

GRID-Nº1 BIAS VOLTS = -155



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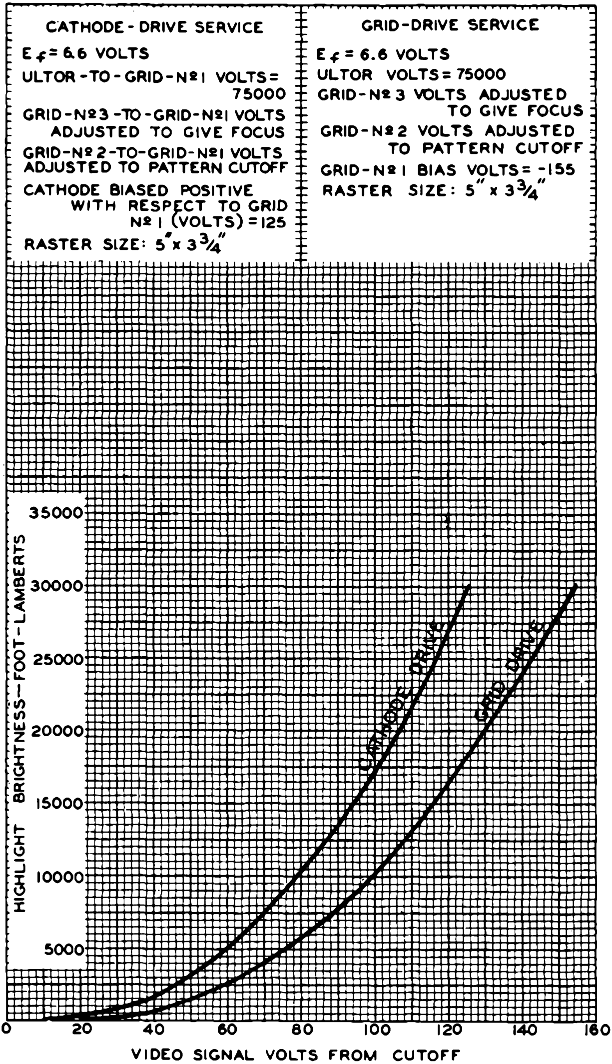
AVERAGE DRIVE CHARACTERISTICS



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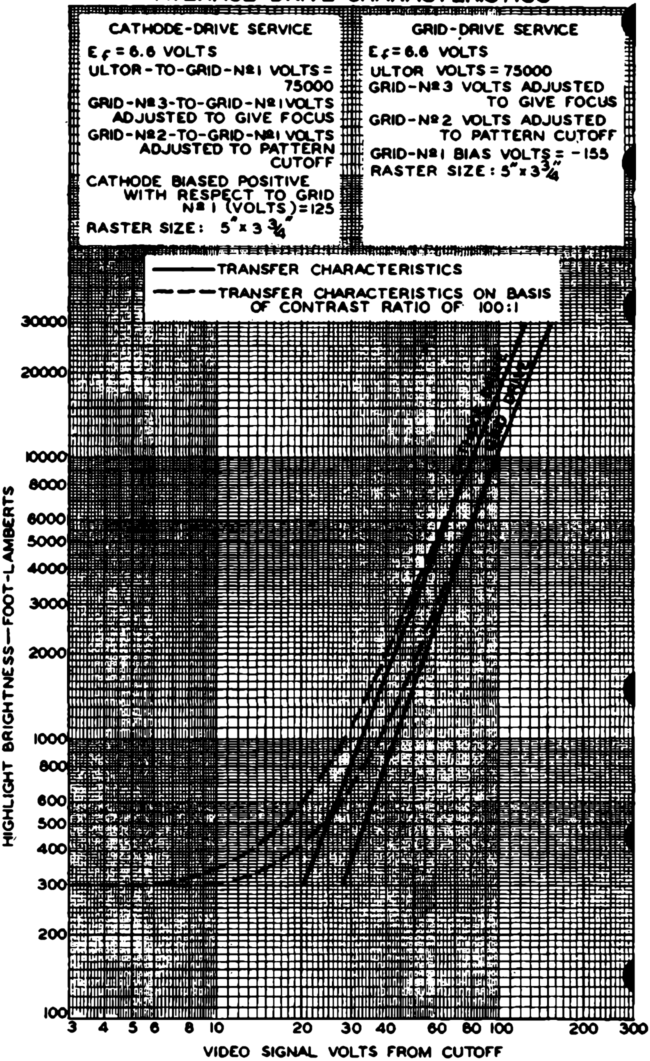
AVERAGE DRIVE CHARACTERISTICS



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SMALL, COMPACT, RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

DATA

General:

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

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . . 6 μμf
- Cathode to all other electrodes . . . . . 5 μμf
- External conductive coating to ultor. . . {350 max. μμf / 250 min. μμf}

Faceplate, Spherical. . . . . Filterglass
- Light transmission (Approx.). 80%

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

Focusing Method . . . . Electrostatic

Deflection Method . . . . .Magnetic

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

Ion-Trap Gun. . . . . . Requires 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"

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.). 3 lbs

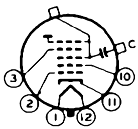
Mounting Position . . . . Any

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

Bulb. J67-1/2

Base. . . . . . .Dwarf-Shell Duodecal 6-Pin (JETEC 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

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

Equipment Design Ranges:

With any ultor voltage (E_{c_5k}) between 4000# and 8000 volts and grid-No.2 voltage (E_{c_2k}) between 85 and 300 volts

Grid-No.4 Voltage Required for Focus:
Changes directly with E_{c_5k} at the rate of approximately 30 volts for each 1000-volt change in E_{c_5k}.
Changes inversely with E_{c_2k} at the rate of approximately 25 volts for each 100-volt change in E_{c_2k}.
Changes inversely with ultor current at the rate of approximately 22.5 volts for each 50-μamp change in ultor current.
For typical values, see *Examples of Use of Design Ranges.*

Grid-No.1 Voltage (E_{c_1k}) for Visual Extinction of Focused Raster . . . *See Cutoff Design Chart for Grid-Drive Service*

Grid-No.1 Video Drive from Raster Cutoff (Black Level):
White-level value (Peak positive) . . . Same value as determined for E_{c_1k} except video drive is positive voltage

Grid-No.4 Current	-25 to +25	μamp
Grid-No.2 Current	-15 to +15	μamp
Ion-Trap Magnet Current (Average)**	$\sqrt{E_{c_5k}/8000} \times 32$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{E_{c_5k}/8000} \times 36$	gausses
Field Strength of Adjustable Centering Magnet	0 to 5	gausses

▲,#,**,§: See next page.

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Examples of Use of Design Ranges:

With ultor voltage of	*6000*	*8000*	*volts*
and grid-No. 2 voltage of	*150*	*200*	*volts*
Grid-No. 4 Voltage for Focus with Ultor Current of 100 μamp	+15 to +315	+60 to +360	volts
Grid-No. 1 Voltage for Visual Extinction of Focused Raster.	−13 to −35	−17 to −46	volts
Grid-No. 1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	13 to 35	17 to 46	volts
Minimum Field Strength of PM Ion-Trap Magnet.	31	36	gausses

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No. 1 VOLTAGE.	8000 max.	volts
GRID-No. 4-TO-GRID-No. 1 VOLTAGE:		
Positive value.	500 max.	volts
Negative value.	500 max.	volts
GRID-No. 2-TO-GRID-No. 1 VOLTAGE.	400 max.	volts
CATHODE-TO-GRID-No. 1 VOLTAGE:		
Positive peak value	130 max.	volts
Positive bias value	100 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

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

\# Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No. 1 voltage. In general, the ultor voltage or ultor-to-grid-No. 1 voltage should not be less than 4000 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.

**, §: See next page.

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Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) between 4000# and 8000 volts
and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 100 and 400 volts

Grid-No.4-to-Grid-No.1
Voltage Required for Focus:
Changes directly with $E_{c_5g_1}$ at the rate of approximately 30 volts for each 1000-volt change in $E_{c_5g_1}$.
Changes inversely with $E_{c_2g_1}$ at the rate of approximately 25 volts for each 100-volt change in $E_{c_2g_1}$.
Changes inversely with ultor current at the rate of approximately 22.5 volts for each 50-μamp change in ultor current.
For typical values, see *Examples of Use of Design Ranges.*

Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for Visual Extinction of Focused Raster . . . . *See Cutoff Design 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}

Grid-No.4 Current.	-25 to +25	μamp
Grid-No.2 Current.	-15 to +15	μamp
Ion-Trap Magnet Current (Average)**.	$\sqrt{E_{c_5g_1}/8000} \times 32$	ma
Minimum Field Strength of PM Ion-Trap Magnet§.	$\sqrt{E_{c_5g_1}/8000} \times 36$	gausses
Field Strength of Adjustable Centering Magnet. . . .	0 to 5	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*6000*	*8000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*150*	*200*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for Focus with Ultor Current of 100 μamp.	+15 to +315	+60 to +360	volts

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

Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 4000 volts.

§: See next page.

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Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster.	14 to 30	17 to 39	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak negative)	14 to 30	17 to 39	volts
Minimum Field Strength of PM Ion-Trap Magnet . . .	31	36	gausses

Maximum Circuit Values:

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

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437 or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

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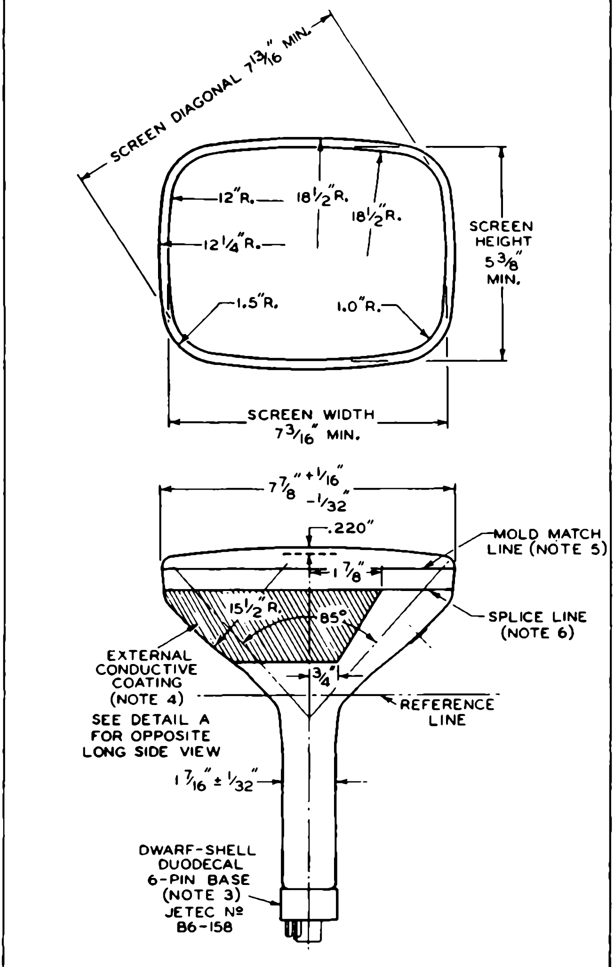

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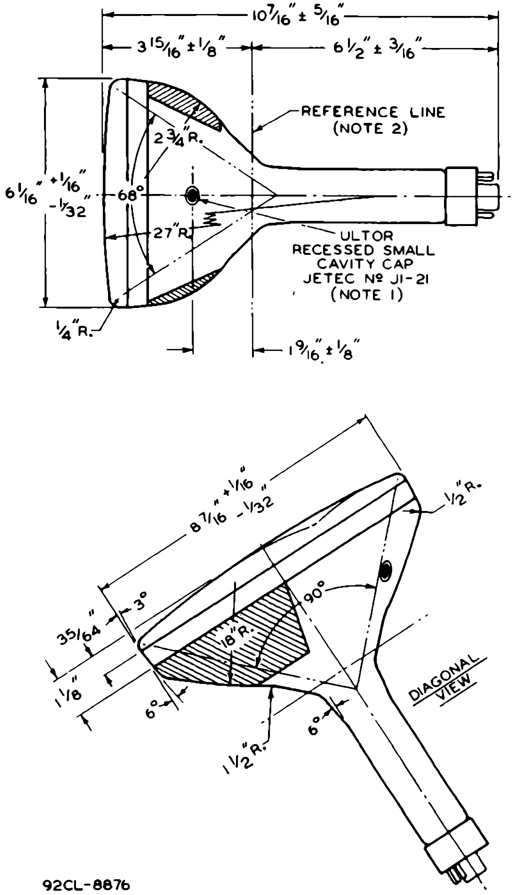

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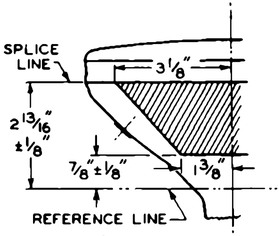

DETAIL A

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.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 VACANT PIN POSITION No.6.

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

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS 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 FACE PANEL JUST ABOVE THE MOLD MATCH IS 0.040" WHEN THE TUBE IS ROTATED ABOUT THE AXIS OF THE NECK AND SUPPORTED AT THE REFERENCE LINE.

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

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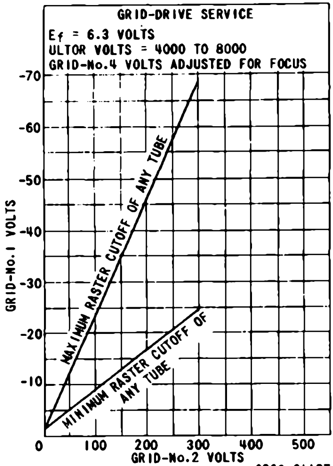
CUTOFF DESIGN CHARTS



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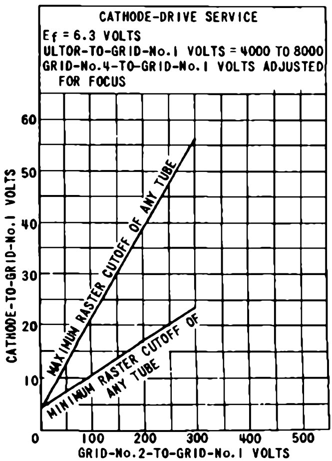

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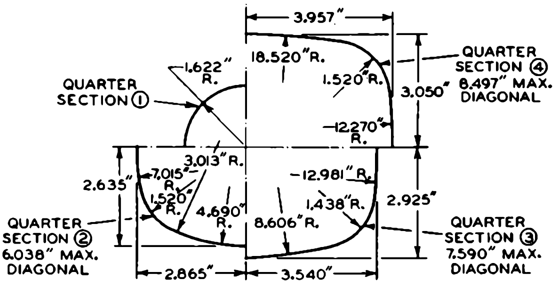
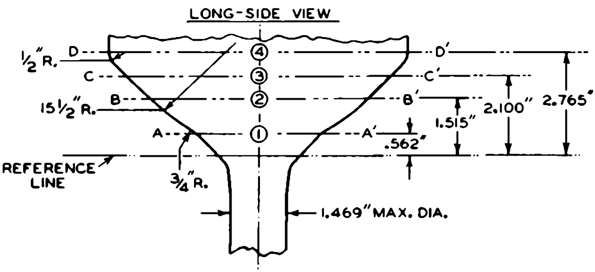
BULB-CONTOUR DIMENSIONS



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

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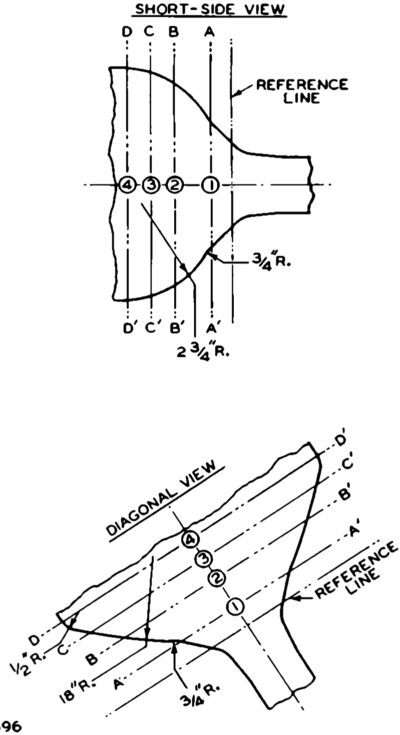
FOR MAXIMUM SPACE REQUIREMENTS



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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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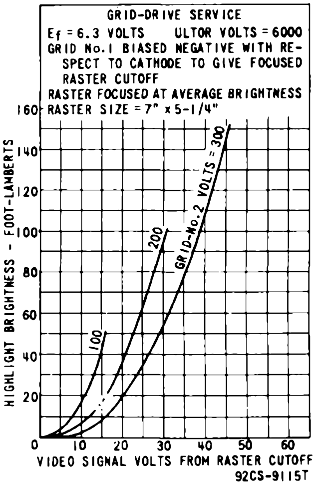
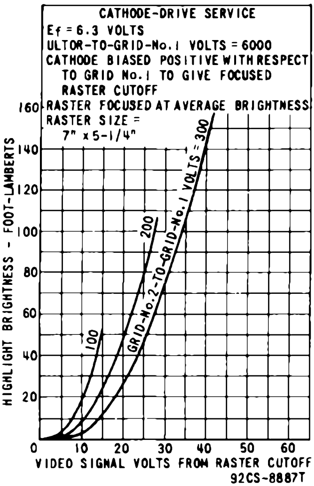
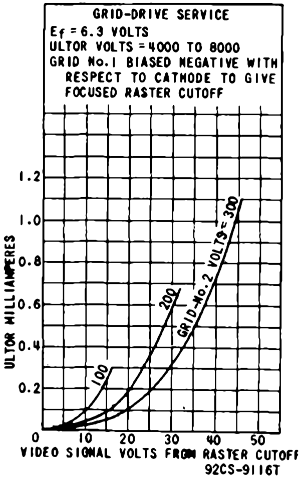
AVERAGE DRIVE CHARACTERISTICS

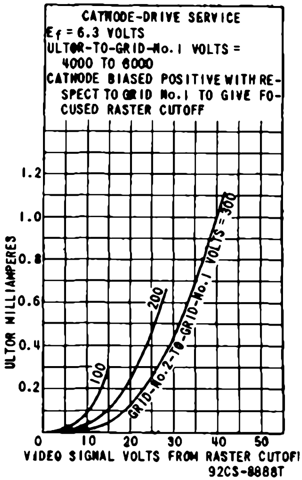




8DP4

AVERAGE DRIVE CHARACTERISTICS





9AP4/1804-P4

KINESCOPE

9AP4

Heater	Coated Unipotential Cathode	
Voltage	2.5	a-c or d-c volts
Current	2.1	amp.
Focus		Electrostatic
Deflection		Magnetic
Phosphor		No.4
Fluorescence		White
Persistence		Medium
Direct Interelectrode Capacitance:		
Grid No.1 to All Other Electrodes		9 μμf
Overall Length		21" ± 3/8"
Diameter		9" ± 1/8"
Bulb		J-72
Cap		Medium Metal
Base		Medium 6-Pin

MAXIMUM RATINGS and TYPICAL OPERATING CONDITIONS

Maximum Ratings Are Based on a Line-Voltage Design Center of 117 Volts

High-Voltage Electrode (Anode No.2) Volt.	7000 max.		volts
Focusing Electrode (Anode No.1) Volt.	2000 max.		volts
Accelerating Electrode (Grid No.2) Volt.	250 max.		volts
Control Electrode (Grid No.1) Volt.	Never positive		
Fluorescent Screen Input Power/sq cm:			
Fixed Pattern	2.5 max.		mw
Moving Pattern	5.0 max.		mw
Grid Circuit Resistance	1.5 max.		megohms
Typical Operation:			
Cathode	Should be connected to one side or to mid-tap of heater winding		
Anode No.2 Voltage	6000	7000	volts
Anode No.1 Voltage ◻	1225	1425	approx. volts
Grid No.2 Voltage	250	250	volts
Grid No.1 Voltage ○	Adjusted to give suitable luminous spot		
Grid No.1 Signal-Swing Volt.▲	25	25	approx. volts

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

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

○ Approximately 35% of Grid No.2 voltage is required for current cut-off when, in some applications, it is necessary to use the maximum permissible grid-circuit resistance.

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

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

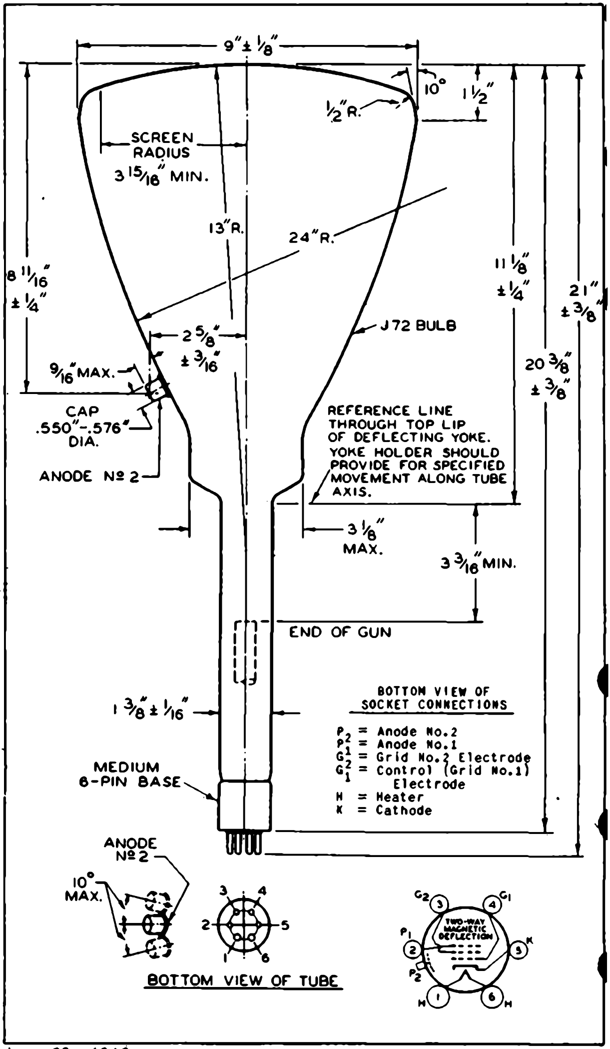
→ Indicates a change.

Jan. 30, 1942 DATA

9AP4

9AP4/1804-P4

KINESCOPE



Jan. 30, 1942 92C-6015R1

10BP4

10BP4 Delete

KINESCOPE

MAGNETIC FOCUS MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6	amp

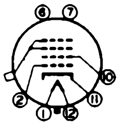
Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes	6.5	μμf
Cathode to All Other Electrodes	5.0	μμf
External Conductive Coating to Anode No.2	2500 max.	μμf
	500 min.	μμf

Phosphor (For Curves, see front of this Section)	No.4
Fluorescence and Phosphorescence	White
Persistence of Phosphorescence	Medium
Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angle (Approx.)	50°
Ion Trap	Magnetic
External Coating	Conductive
Overall Length	17-5/8" ± 3/8"
Greatest Diameter of Bulb	10-1/2" ± 1/8"
Minimum Useful Screen Diameter	9"
Raster Size (Approx.)	6" x 8"
Mounting Position	Any
Cap	Recessed Small Cavity
Base	Small-Shell Duodecal 7-Pin

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 - Anode, Grid No.3

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

ANODE VOLTAGE■	10000 max.	volts
GRID-No.2 VOLTAGE	410 max.	volts
GRID-No.1 (CONTROL ELECTRODE) 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

■ See next page.

← Indicates a change.

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10BP4
KINESCOPE

→ **Typical Operation:**

Anode Voltage*	9000 . .	volts
Grid-No.2 Voltage.	250 . .	volts
Grid-No.1 Voltage°	-27 to -63	volts

Maximum Circuit Values:

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

→ **Minimum Circuit Values:**

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

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

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

Components:

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

■ The anode and grid No.3 which are connected together within tube are referred to herein as anode.

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 8000 volts.

° Visual extinction of undeflected focused spot.

\# The dc current required by this magnet is approx. 109 ma. for the typical operating conditions shown.

▲ The horizontal deflecting-coil current required by this yoke to produce 8" picture width is approx. 470 ma. peak-to-peak under the typical operating conditions shown. The current varies directly as the square root of the anode voltage.

** The dc current required by this coil is approx. 115 ma. for the typical operating conditions shown and using combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 20 foot-lamberts on a 6" x 8" picture area. Distance from reference line (see Outline Drawing) to center line of air gap is approx. 3-1/4".

→ Indicates a change.

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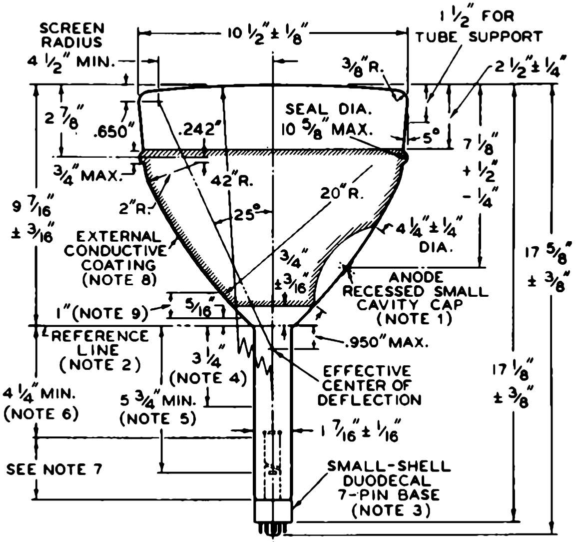
10BP4
KINESCOPE

Delete

10BP4



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

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + .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: APPROX. DISTANCE TO CENTER OF FOCUSING-COIL AIR GAP.

NOTE 5: DISTANCE TO INTERNAL POLE PIECES. PLANE THROUGH PIN No. 6 AND TUBE AXIS PASSES THROUGH LINE JOINING CENTERS OF POLE PIECES. DIRECTION OF PRINCIPAL FIELD OF ION-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO PIN No. 6 AND SOUTH POLE TO PIN No. 12.

10BP4
KINESCOPE

(continued from preceding page)

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

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

NOTE 8: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

92CM-6663R2

10BP4-A
KINESCOPE

MAGNETIC FOCUS | MAGNETIC DEFLECTION

DATA

General:

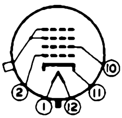
Heater, for Unipotential Cathode:
- Voltage . . . . 6.3 . . . . . . ac or dc volts
- Current . . . . 0.6 . . . . amp

Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to All Other Electrodes . . . . 6 . . . $\mu\mu f$
- Cathode to All Other Electrodes . . . . . 5 . . . $\mu\mu f$
- External Conductive Coating to Anode . { 2000 max. $\mu\mu f$ / 500 min. $\mu\mu f$

Face Plate (Transmission of about 65%) . . RCA "Filterglass"
Phosphor (For Curves, see front of this Section) No.4-Sulfide Type
- Fluorescence and Phosphorescence . . . . White
- Persistence of Phosphorescence . . . . Medium

Focusing Method . . . . Magnetic
Deflection Method . . . . Magnetic
Deflection Angle (Approx.) . . . . 52°
Ion-Trap Gun . . . . . Requires External Double-Field Magnet
Overall Length . . . . 17-5/8" ± 3/8"
Greatest Diameter of Bulb . . . . 10-1/2" ± 1/8"
Screen Diameter . . . . 9-3/8"
Mounting Position . . . . Any
Cap . . . . Recessed Small Cavity
Base . . . . Small-Shell Duodecal 5-Pin
- Basing Designation for BOTTOM VIEW . . . . $12D_1$

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



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

Maximum Ratings, *Design-Center Values:*

ANODE[o] 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

[o] Anode and grid No.3, which are connected together within tube, are referred to herein as anode.

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

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

10BP4-A

KINESCOPE

Typical Operation:

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

Maximum Circuit Values:

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

Minimum Circuit Values:

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

Grid-No.1-Circuit Resistance	150 min.	ohms
Grid-No.2-Circuit Resistance	470 min.	ohms
Anode-Circuit Resistance	15000 min.	ohms

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

Components:

Horizontal-Deflection-Output & High-Voltage Transformer: For use with pulse-operated high-voltage supply giving 10000-12000 volts	RCA-217T1
Horizontal Linearity Control	RCA-207R1
Width Control.	RCA-206R1
Vertical-Deflection Output Transformer	RCA-204T9
Deflecting Yoke.	RCA-205D1
Ion-Trap Magnet (Permanent-Magnet Type).	RCA-203D3
Focusing Coil°°	RCA-202D1

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 8000 volts.

† For JETEC Focusing Coil No.106, or equivalent, positioned with center line of air gap approximately 3-1/4 inches from Reference Line (See Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 25 foot-lamberts for 9000 volts, or 30 foot-lamberts for 11000 volts, on an 8" x 6" picture area.

\# For JETEC Ion-Trap Magnet No.108, or equivalent, located with main pole pieces longitudinally opposite internal pole pieces, and rotated to give maximum brightness.

°° Renewal Sales item only.

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10BP4-A

10BP4-A

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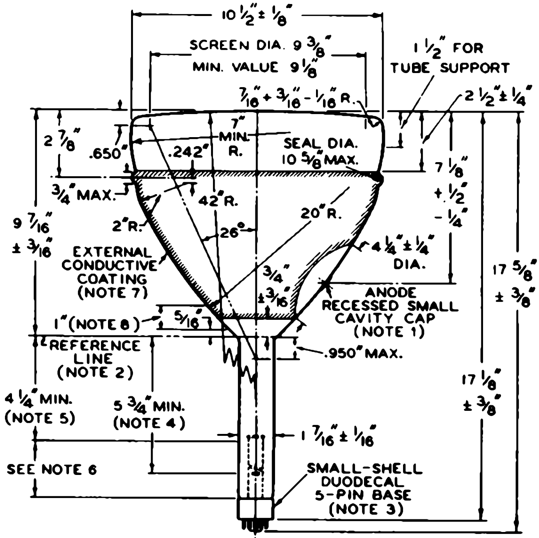


92CM-6663R3

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

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + .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 MORE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF 1-7/8".

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

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

10BP4-A

KINESCOPE

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

NOTE 7: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

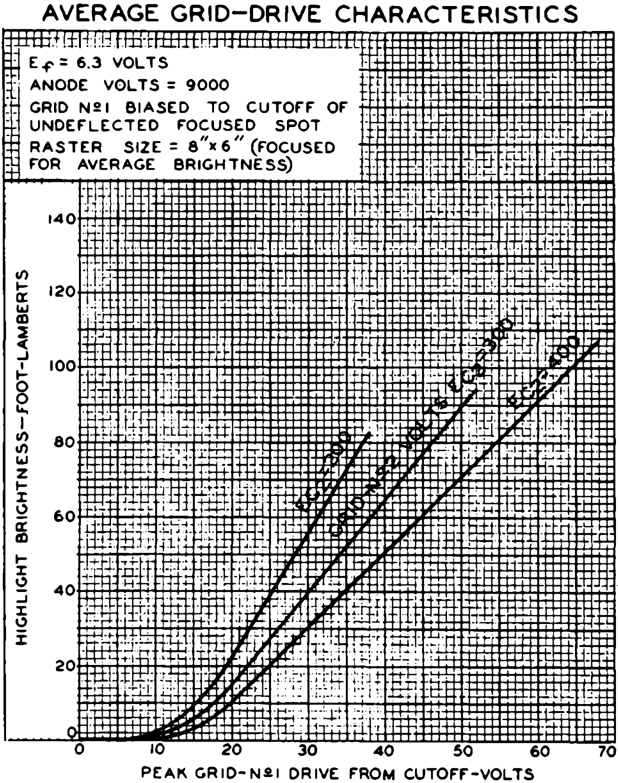
NOTE 8: FOR TUBE SUPPORT WHICH MUST NOT COVER SPECIFIED CLEAR AREA AROUND ANODE CAP.

10BP4-A

KINESCOPE

CURVES

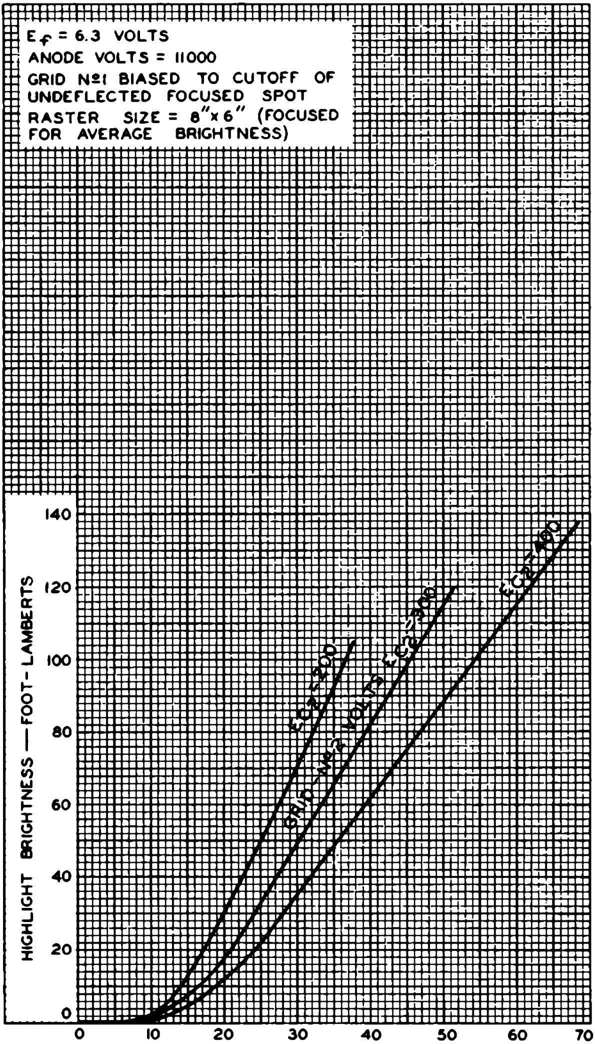
The following Grid-Drive Characteristits Curves are for the condition with grid No.1 biased to give visual extinction of the undeflected, focused spot. In viewing television pictures, it will be found that the actual cutoff voltage corresponding to black in the picture is approximately 5 volts less negative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



RCA

10BP4-A

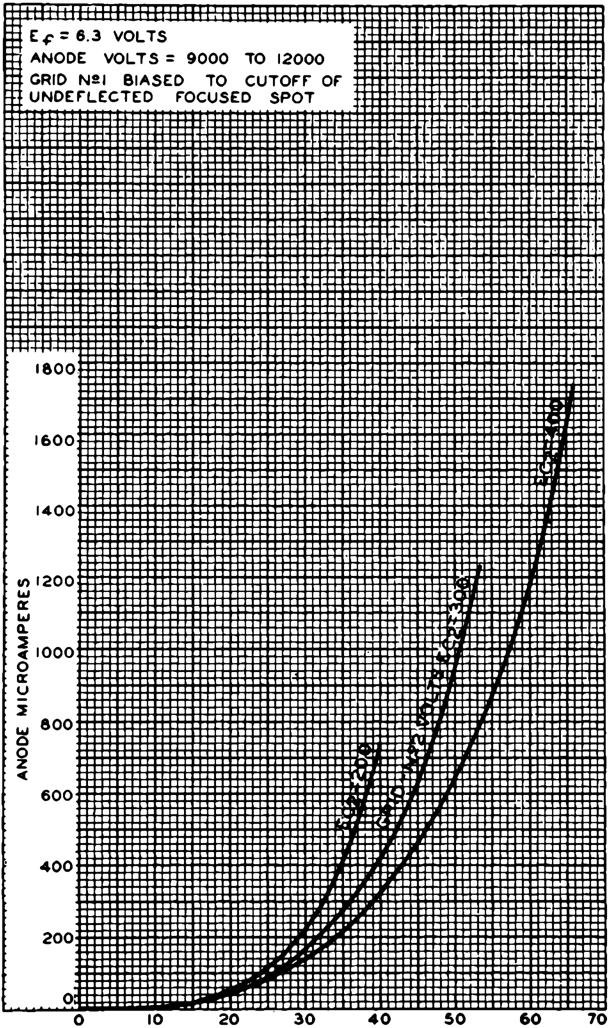
AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

10BP4-A

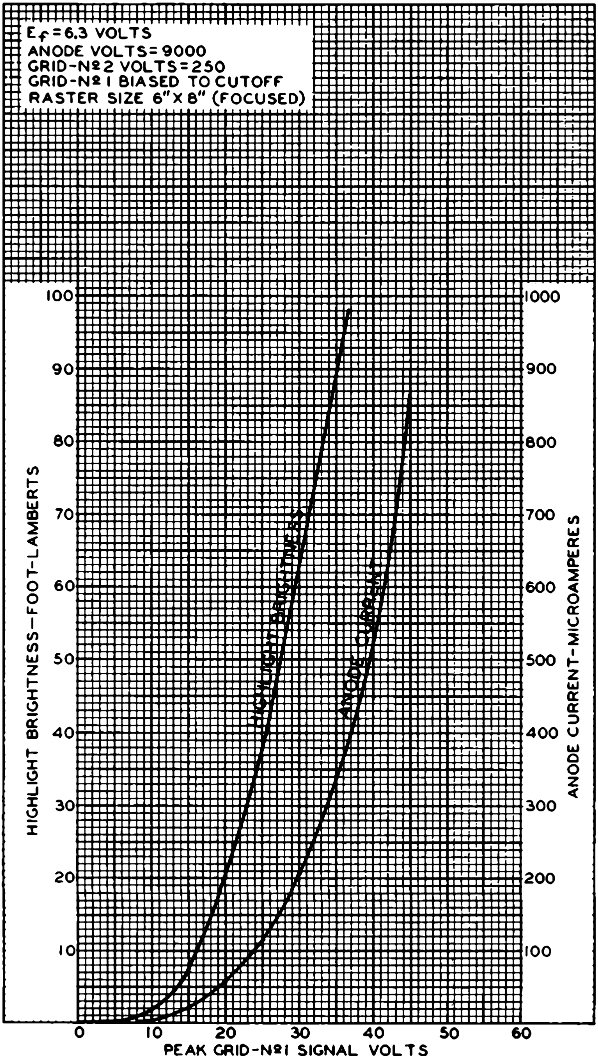
AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

10BP4

AVERAGE CHARACTERISTICS



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

10KP7
OSCILLOGRAPH TUBE

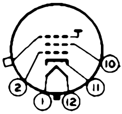
MAGNETIC FOCUS MAGNETIC DEFLECTION

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 . . . . . 6 μμf ←
  Cathode to all other electrodes . . . . . . 5 μμf
Faceplate . . . . Filterglass ←
  Light transmission (Approx.). . . . . 77% ←
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 . . . . 17-5/8" ± 3/8"
Greatest Diameter of Bulb . . . . 10-1/2" ± 1/16" ←
Minimum Useful Screen Diameter. . . . . 9"
Weight (Approx.). 10 lbs ←
Mounting Position . . . . Any
Cap . . . . .Recessed Small Cavity (JETEC No.J1-21) ←
Bulb. . . . . J-84 ←
Base. . . . . Small-Shell Duodecal 5-Pin (JETEC 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. . . . . 10000 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

● 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 10KP7, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 10KP7, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

▲: See next page. ← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

10KP7

OSCILLOGRAPH TUBE

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

Equipment Design Ranges:

For any ultor voltage (E_{c_3}) between 7000 and 10000 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	-10.8% to -25.2% of E_{c_2}	volts
Grid-No.2 Current.	-15 to +15	µamp
Focusing-Coil Current (DC)°°	$\left[\sqrt{\frac{E_{c_3}}{7000}} \times 99\right] \pm 15\%$	ma
Spot Position.	##	

Examples of Use of Design Ranges:

For ultor voltage of	*7000*	*9000*	*volts*
and grid-No.2 voltage of	*250*	*250*	*volts*
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-27 to -63	-27 to -63	volts
Focusing-Coil Current (DC) .	99 ± 15%	112 ± 15%	ma

Maximum Circuit Values:

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

▲ 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. In general, the ultor voltage should not be less than 7000 volts.

°° For specimen focusing coil similar to JETEC Focusing Coil No.106 positioned with air gap toward faceplate and center line of air gap 3-1/4" from Reference Line (*See Dimensional Outline*) and ultor current of 200 microamperes.

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

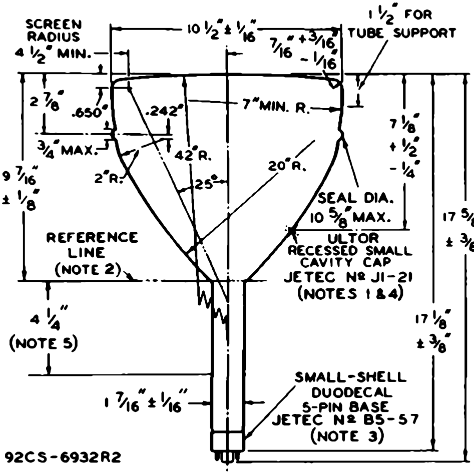
→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

10KP7

10KP7

OSCILLOGRAPH TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No. 3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ±10°. ULTOR 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: FOR TUBE SUPPORT WHICH MUST BE KEPT AT LEAST 2" AWAY FROM ULTOR CAP.

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

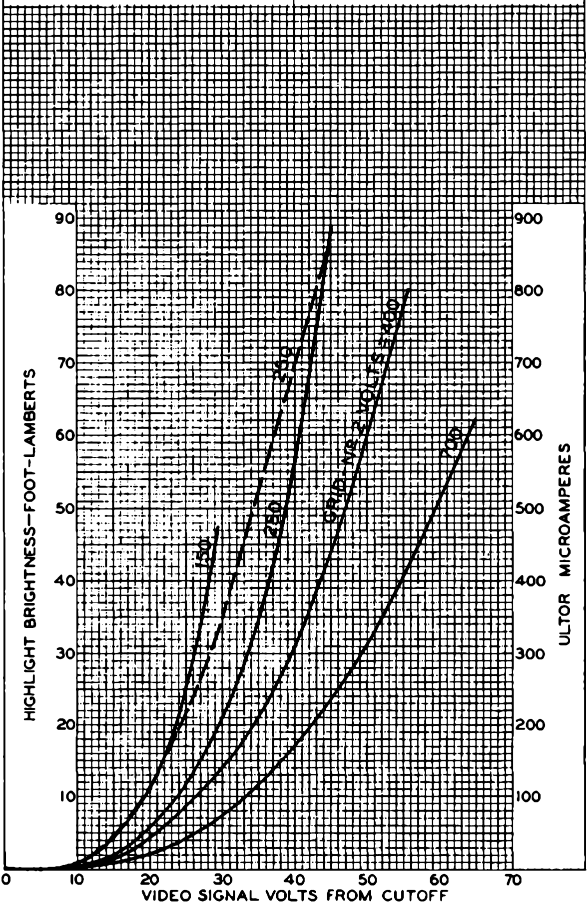
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

10KP7

10KP7

AVERAGE GRID-DRIVE CHARACTERISTICS

——— ULTOR CURRENT	– – – HIGHLIGHT BRIGHTNESS
E_f = 6.3 VOLTS ULTOR VOLTS = 7000 - 10000 GRID Nº 1 BIASED TO CUTOFF OF UNDEFLECTED FOCUSED SPOT	E_f = 6.3 VOLTS ULTOR VOLTS = 8000 GRID-Nº 2 VOLTS = 250 GRID Nº 1 BIASED TO CUTOFF OF UNDEFLECTED FOCUSED SPOT RASTER SIZE = 14 CM x 14 CM



DEC. 19, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7001R2

10SP4

MONITOR KINESCOPE

METAL-BACKED SCREEN

ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA

General:

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

Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to All Other Electrodes . . . . . 6 μμf
- Cathode to All Other Electrodes . . . . . . 5 μμf

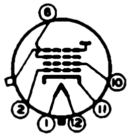
Faceplate, Spherical. . . . . Filterglass
- Light Transmission (Approx.) 66%

Phosphor°, Metal-Backed . . . . P4—Sulfide Type
- Fluorescence and Phosphorescence . . . . White
- Persistence of Phosphorescence . . . . Short

Focusing Method . . . . Electrostatic
Deflection Method . . . . Magnetic
Deflection Angle (Approx.) . . . . 50°
Overall Length . . . . 16-5/8" ± 3/8"
Greatest Diameter of Bulb . . . . 10-1/2" ± 1/8"
Minimum Useful Screen Diameter . . . . 9-1/8"
Picture Size (Within minimum-useful-screen area) . . 8" x 6"
Mounting Position . . . . Any
Cap . . . . Recessed Small Cavity (JETEC No. J1-21)
Base . . . . . Small-Shell Duodecal 6-Pin (JETEC No. B6-63)

BOTTOM VIEW

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



Pin 12 - Heater
Cap - Ultor (Grid No.4 & Collector)

Maximum Ratings, *Design-Center Values*:

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

° For curves, see front of this Section.

● In the 10SP4, grid No.4 which has the ultor function, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

10SP4

MONITOR KINESCOPE

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds .	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode .	180 max.	volts

Equipment Design Ranges:

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

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

Examples of Use of Design Ranges:

For ultor voltage of	*12000*	*14000*	*volts*
and grid-No.2 voltage of	*200*	*200*	*volts*
Grid-No.3 Voltage for Focus with Ultor Current of 100 μamp .	1400 to 1900	1640 to 2225	volts
Grid-No.1 Voltage for Visual Extinction of 8" x 6" Raster	-18 to -48	-18 to -48	volts

Maximum Circuit Values:

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

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

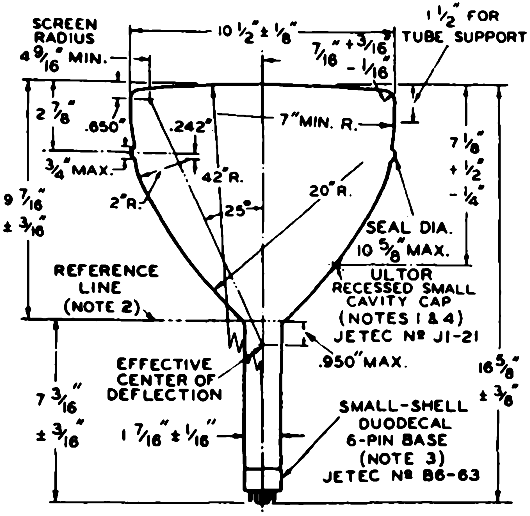
** Grid-No.3 Current increases as the ultor voltage is decreased.

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

10SP4

10SP4

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".

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

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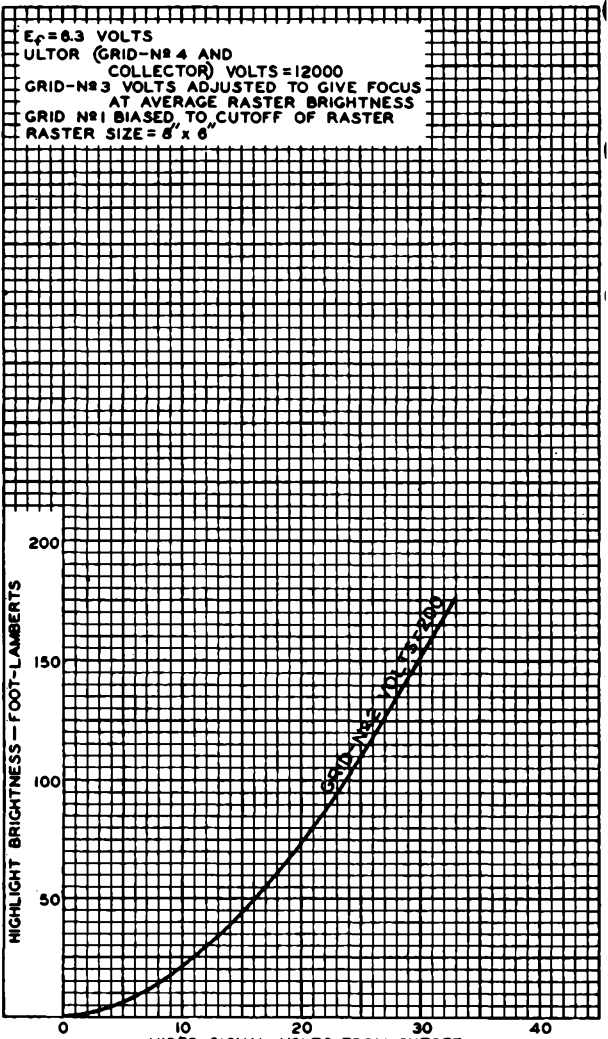
10SP4

10SP4

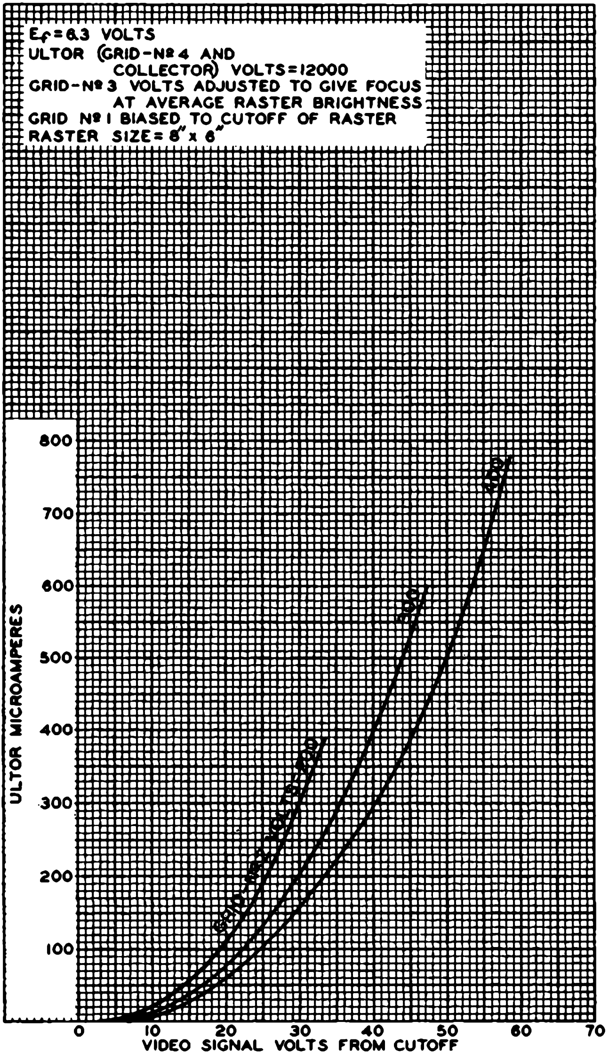
AVERAGE GRID-DRIVE CHARACTERISTIC



10SP4

10SP4

AVERAGE GRID-DRIVE CHARACTERISTICS



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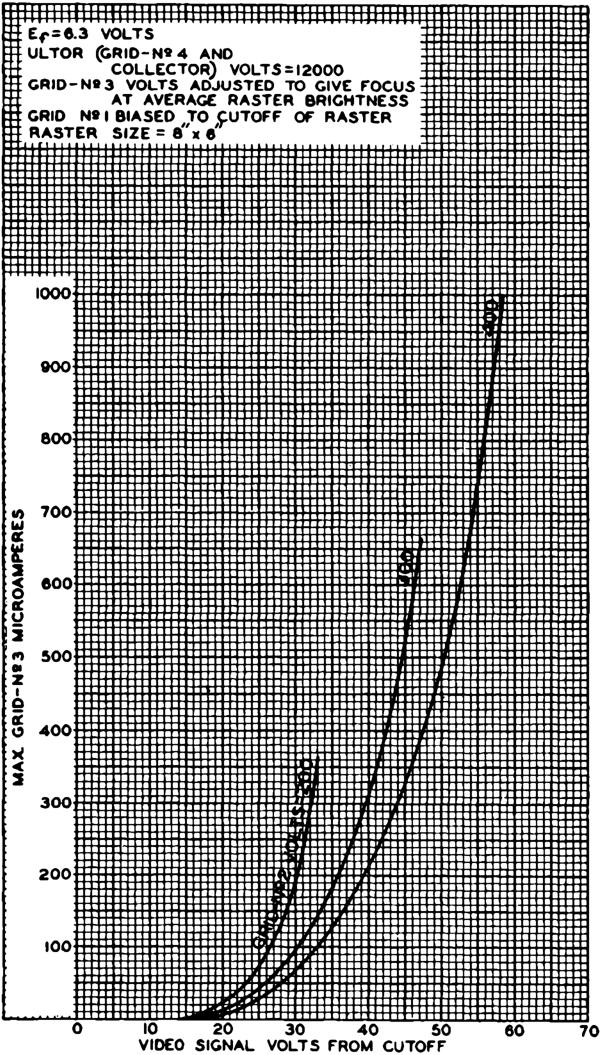
10SP4

GRID-DRIVE CHARACTERISTICS



12DP7-A
OSCILLOGRAPH TUBE

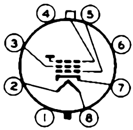
MAGNETIC FOCUS — MAGNETIC DEFLECTION

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	9	$\mu\mu$f
Cathode to all other electrodes	6	$\mu\mu$f
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		76%
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.)		50°
Overall Length		19-5/8" ± 1/2"
Greatest Diameter of Bulb		12" ± 3/16"
Minimum Useful Screen Diameter		10"
Weight (Approx.)		8 lbs
Mounting Position		Any
Cap		Medium (JETEC No.C1-5)
Bulb		J96
Base		Long Medium-Shell Octal 8-Pin (JETEC No.B8-65), or Long Medium-Shell Octal 5-Pin (JETEC No.B5-80)
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	10000 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

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

← Indicates a change.

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12DP7-A

OSCILLOGRAPH TUBE

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

Equipment Design Ranges:

For any ultor voltage (E_{c_3}) between 4000 and 10000 volts and grid-No.2 voltage (E_{c_2}) between 150 and 750 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)°° .	$\left[\sqrt{\frac{E_{c_3}}{4000}} \times 88.5\right] \pm 15\%$	ma
Spot Position.	##	

Examples of Use of Design Ranges:

For ultor voltage of	*4000*	*7000*	*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) .	75 to 102	99 to 135	ma

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 specimen focusing coil similar to JETEC Focusing Coil No.106 positioned with air gap toward faceplate and center line of air gap 4-1/8" from Reference Line *(See Dimensional Outline)* and ultor current of 200 microamperes.

The center of the undeflected, unfocused spot will fall within a circle having a 20-mm radius concentric with the center of the tube face.

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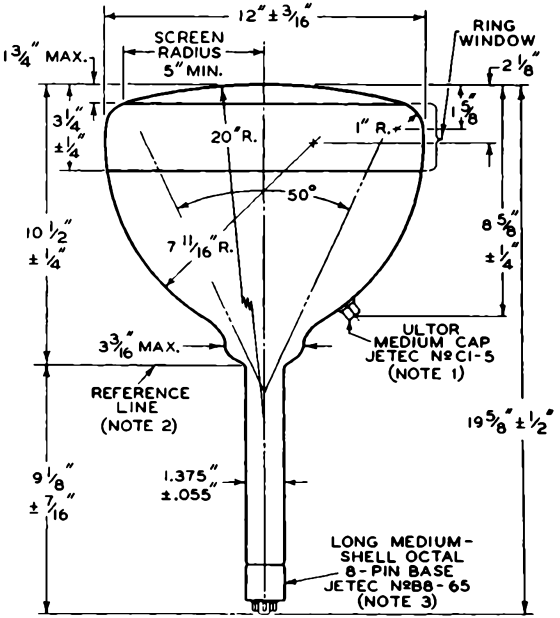
12DP7-A

OSCILLOGRAPH TUBE



92CM-6375R6

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.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 No.5.

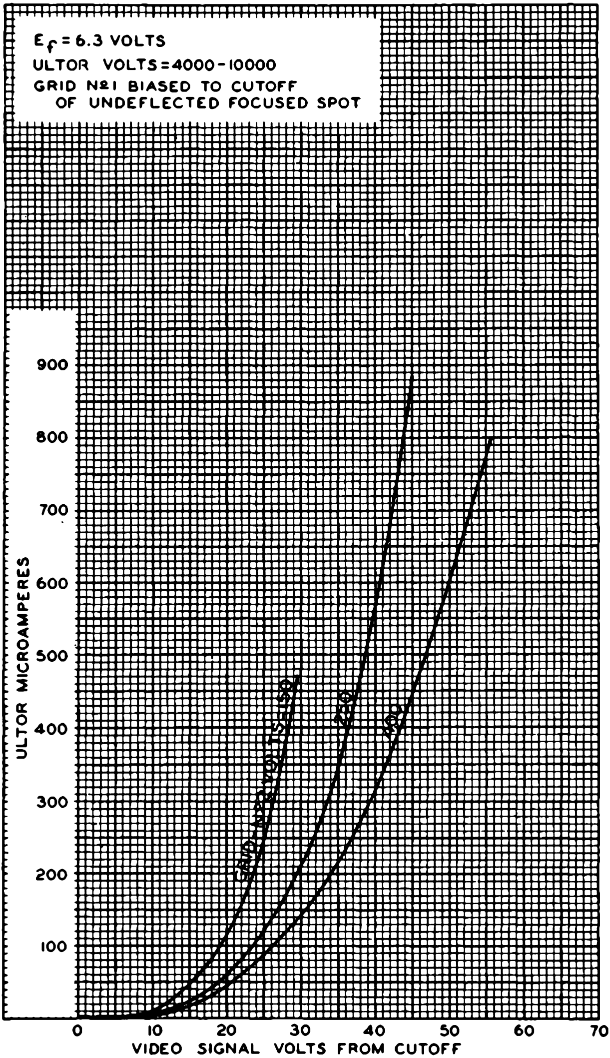
NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.430" + .003" - .000" I.D. and 2" LONG WILL REST ON BULB CONE.

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

RCA

12DP7-A

AVERAGE GRID-DRIVE CHARACTERISTICS



12DP7-B
OSCILLOGRAPH TUBE

MAGNETIC FOCUS MAGNETIC DEFLECTION

The 12DP7-B is the same as the 12DP7-A except for the following items:

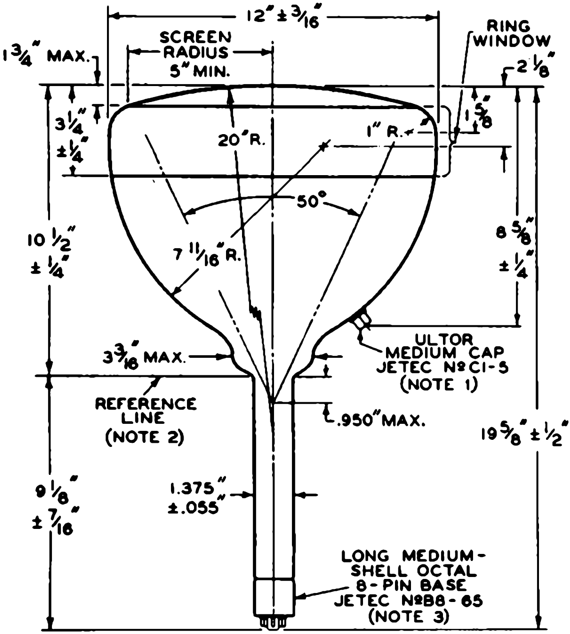
General:

Faceplate, Spherical . . . . Filterglass
Light transmission (Approx.) 76%

12DP7-B

12DP7-B

OSCILLOGRAPH TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.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 No.5.

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

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

92CM-6375R5

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

12DP7-B

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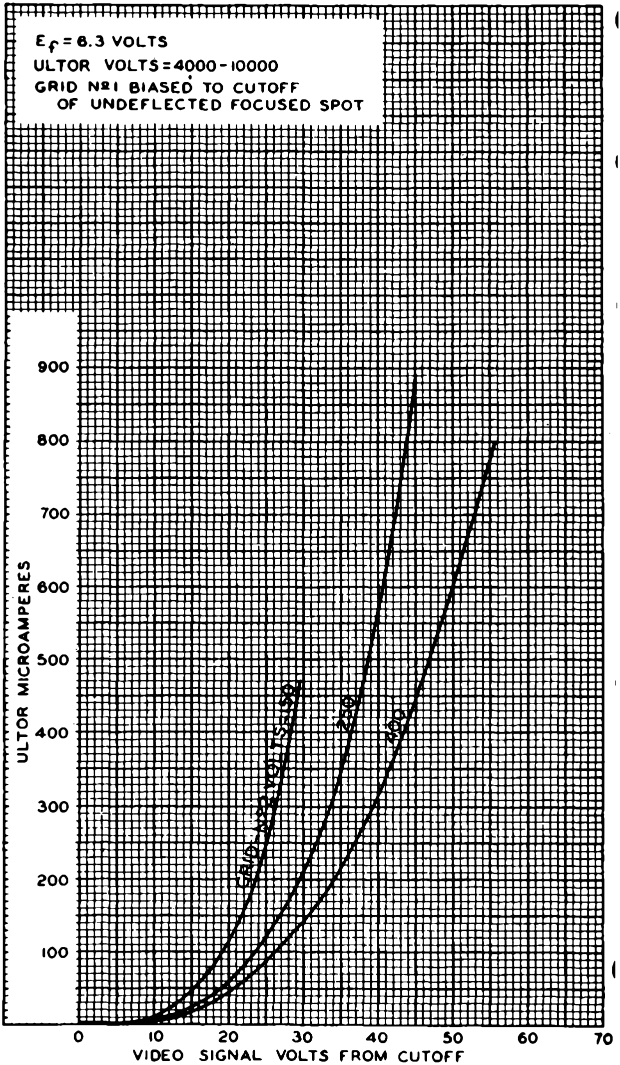
12DP7-B

AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

12LP4

12LP4

KINESCOPE

MAGNETIC FOCUS MAGNETIC DEFLECTION

DATA

General:

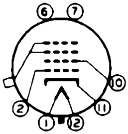
Heater, for Unipotential Cathode:
- Voltage . . . 6.3 . . . ac or dc volts
- Current . . . 0.6 . . . amp

Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to All Other Electrodes . . . 6 $\mu\mu$f
- Cathode to All Other Electrodes . . . 5 $\mu\mu$f
- External Conductive Coating to Anode . . . 3000 max. $\mu\mu$f / 750 min. $\mu\mu$f

Phosphor (For Curves, see front of this Section) . . . No.4
- Fluorescence . . . White
- Phosphorescence . . . White
- Persistence . . . Medium

Focusing Method . . . Magnetic
Deflection Method . . . Magnetic
Deflection Angle (Approx.) . . . 57°
Ion-Trap Gun . . . Requires External Double-Field Magnet
Overall Length . . . 18-3/4 ± 3/8"
Greatest Diameter of Bulb . . . 12-7/16 ± 1/8"
Screen Diameter . . . 11-3/8"
Raster Size (Approx.) . . . 7-1/2" x 10"
Mounting Position . . . Any
Cap . . . Recessed Small Cavity
Base . . . Small-Shell Duodecal 7-Pin
- Basing Designation for BOTTOM VIEW . . . 12D

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 -Anode, Grid No.3

Maximum Ratings, *Design-Center Values:*

ANODE VOLTAGE■ . . . 12000 max. volts
GRID-No.2 VOLTAGE . . . 410 max. volts
GRID-No.1 (CONTROL ELECTRODE) 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

■ Anode and grid No.3, which are connected together within tube, are re-referred to herein as anode.

SEPT. 15, 1949 TENTATIVE DATA

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

12LP4

12LP4
KINESCOPE

Typical Operation:

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

Maximum Circuit Values:

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

Minimum Circuit Values:

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

Grid-No.1 - Circuit Resistance.	150 min.	ohms
Grid-No.2 - Circuit Resistance.	470 min.	ohms
Anode-Circuit Resistance	15000 min.	ohms

The resistors should be capable of withstanding the applied voltages.

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

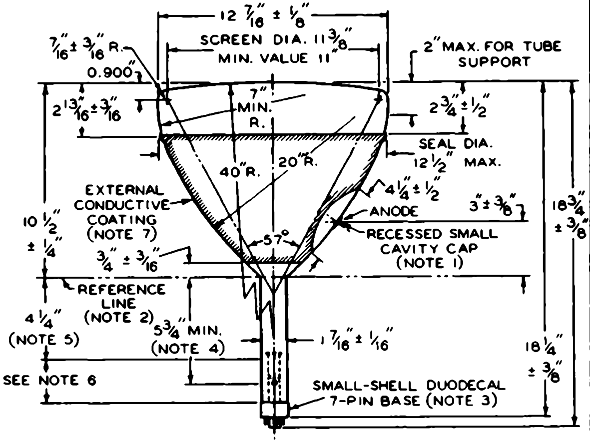
** For JETEC Focusing Coil No.106, or equivalent, positioned with center line of air gap approximately 3-1/4" from Reference Line (See Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 25 foot-lamberts for 9000 volts, or 30 foot-lamberts for 11000 volts, on a 7-1/2" x 10" picture area.

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

CURVES

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

12LP4
KINESCOPE



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

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + .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: DISTANCE OF INTERNAL POLE PIECES. PLANE THROUGH PIN No.6 AND TUBE AXIS PASSES THROUGH LINE JOINING CENTERS OF POLE PIECES. DIRECTION OF PRINCIPAL FIELD OF ION-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO PIN No.6 AND SOUTH POLE TO PIN No.12.

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

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

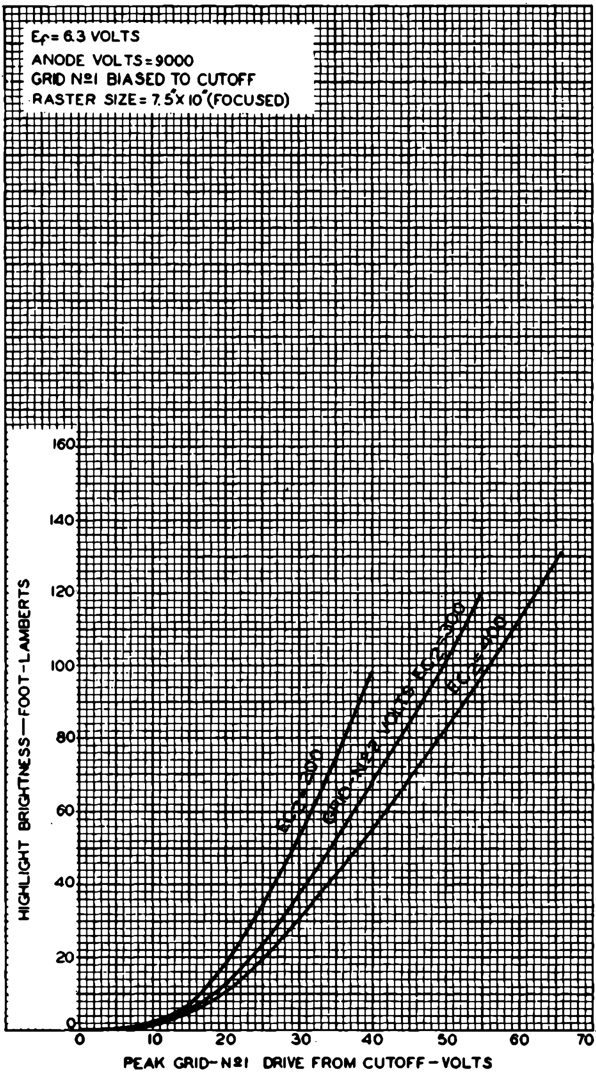
NOTE 7: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

92CM-7276

12LP4

12LP4

AVERAGE GRID-DRIVE CHARACTERISTICS



JUNE 28, 1949

TUBE DEPARTMENT

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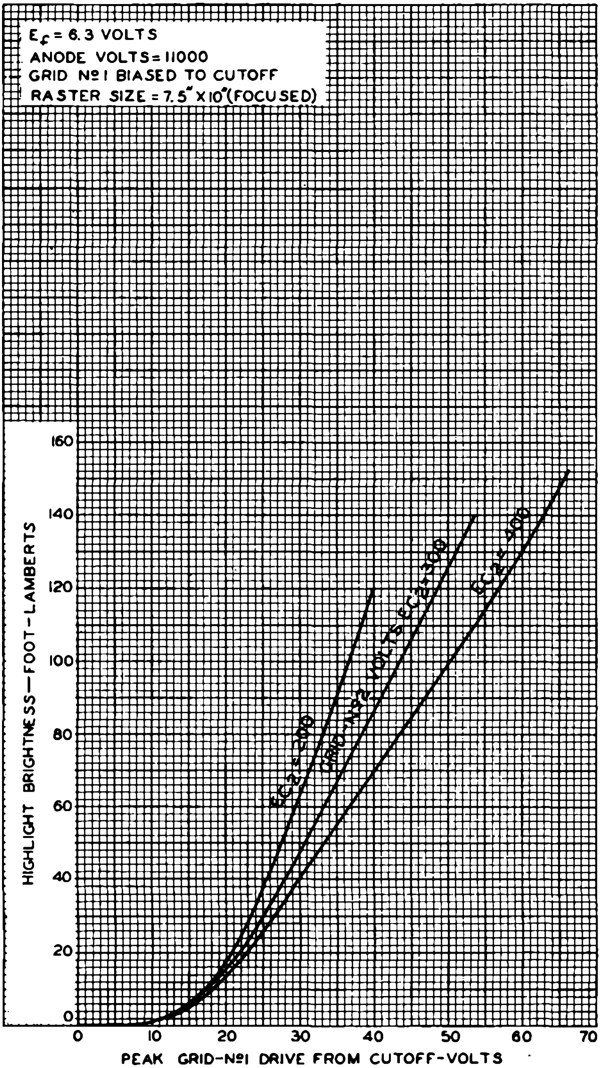
92CM-7309

12LP4

RCA

12LP4

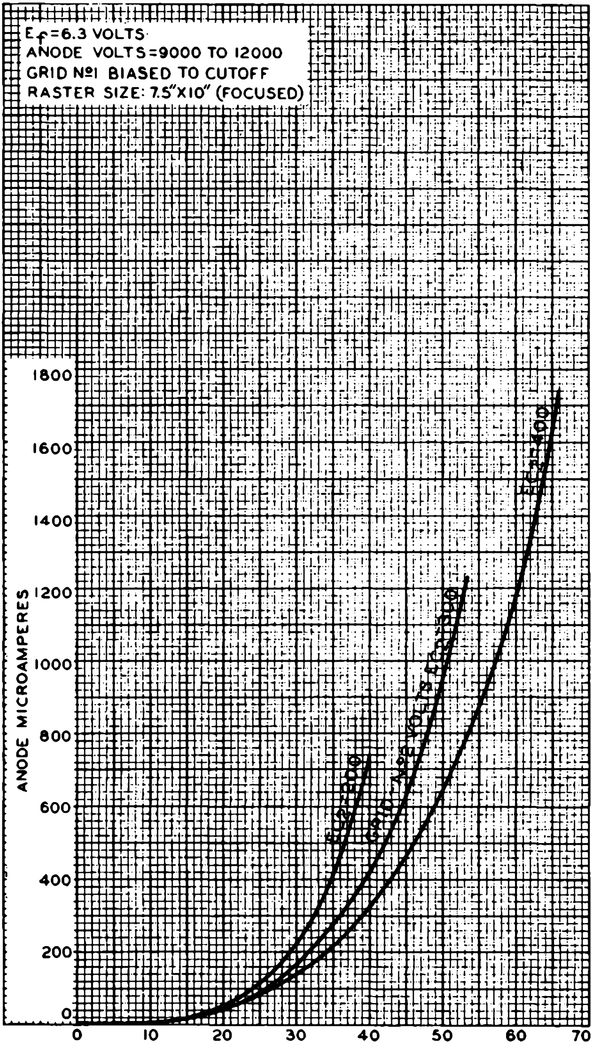
AVERAGE GRID-DRIVE CHARACTERISTICS



12LP4

12LP4

AVERAGE GRID-DRIVE CHARACTERISTICS



12LP4-A

KINESCOPE

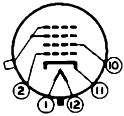
MAGNETIC FOCUS — MAGNETIC DEFLECTION

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 $\mu\mu f$
Cathode to All Other Electrodes	5 $\mu\mu f$
External Conductive Coating to Anode	2000 max. $\mu\mu f$ / 750 min. $\mu\mu f$
Face Plate (Transmission of about 65%)	RCA "Filterglass"
Phosphor (For Curves, see front of this Section)	No.4-Sulfide Type
Fluorescence and Phosphorescence	White
Persistence of Phosphorescence	Medium
Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angle (Approx.)	57°
Ion-Trap Gun	Requires External Double-Field Magnet
Overall Length	18-3/4 ± 3/8"
Greatest Diameter of Bulb	12-7/16 ± 1/8"
Screen Diameter	11-3/8"
Mounting Position	Any
Cap	Recessed Small Cavity
Base	Small-Shell Duodecal 5-Pin
Basing Designation for BOTTOM VIEW	$12D_1$

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



Pin 12-Heater
Cap -Anode, Grid No.3

Maximum Ratings, *Design-Center Values:*

ANODE[□] 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

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

* The product of anode voltage and average anode current should be limited to 6 watts.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

12LP4-A

KINESCOPE

Typical Operation:

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

Maximum Circuit Values:

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

Minimum Circuit Values:

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

Grid-No.1-Circuit Resistance.	150 min.	ohms
Grid-No.2-Circuit Resistance.	470 min.	ohms
Anode-Circuit Resistance	15000 min.	ohms

The resistors should be capable of withstanding the applied voltages.

Components:

Horizontal-Deflection-Output & High-Voltage Transformer: For use with pulse-operated high-voltage supply giving 10000-12000 volts	RCA-217T1
Horizontal Linearity Control	RCA-207R1
Width Control.	RCA-206R1
Vertical-Deflection Output Transformer	RCA-204T9
Deflecting Yoke.	RCA-205D1
Ion-Trap Magnet (Permanent-Magnet Type). . . .	RCA-203D3
Focusing Coil°°.	RCA-202D1

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

** For JETEC Focusing Coil No.106, or equivalent, positioned with center line of air gap approximately 3-1/4" from Reference Line (See Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 17 foot-lamberts for 9000 volts, or 20 foot-lamberts for 11000 volts, on a 10" x 7-1/2" picture area.

\# For JETEC Ion-Trap Magnet No.108, or equivalent, located with main pole pieces longitudinally opposite internal pole pieces, and rotated to give maximum brightness.

°° Renewal Sales item only.

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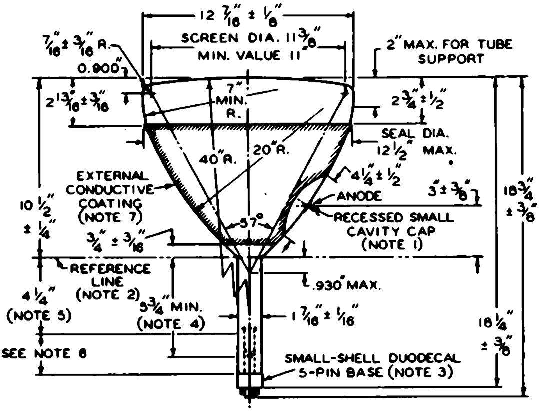
12LP4-A

12LP4-A

KINESCOPE



92CM-7276R2

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

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + .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: DISTANCE TO INTERNAL POLE PIECES. PLANE THROUGH VACANT PIN POSITION No.6 AND TUBE AXIS PASSES THROUGH LINE JOINING CENTERS OF POLE PIECES. DIRECTION OF PRINCIPAL FIELD OF ION-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO VACANT PIN POSITION No.6 AND SOUTH POLE TO PIN No.12.

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

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

NOTE 7: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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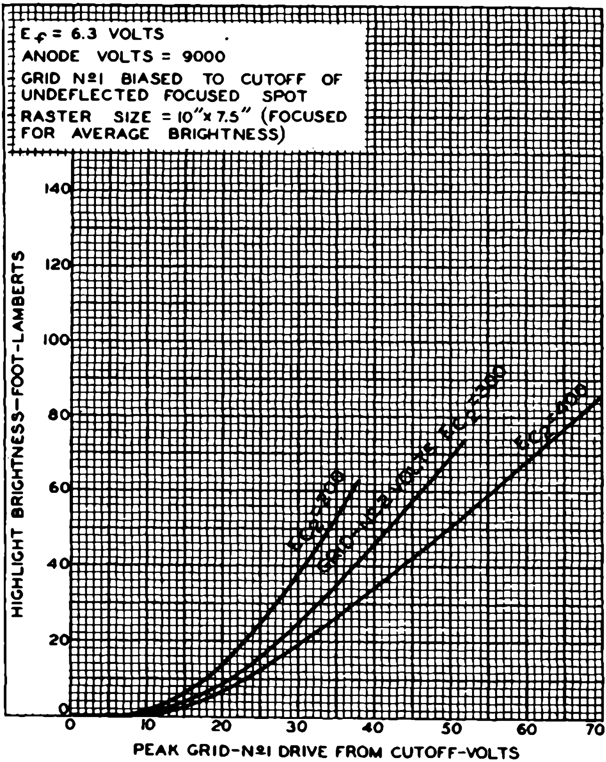
12LP4-A

12LP4-A
KINESCOPE

CURVES

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

AVERAGE GRID-DRIVE CHARACTERISTICS



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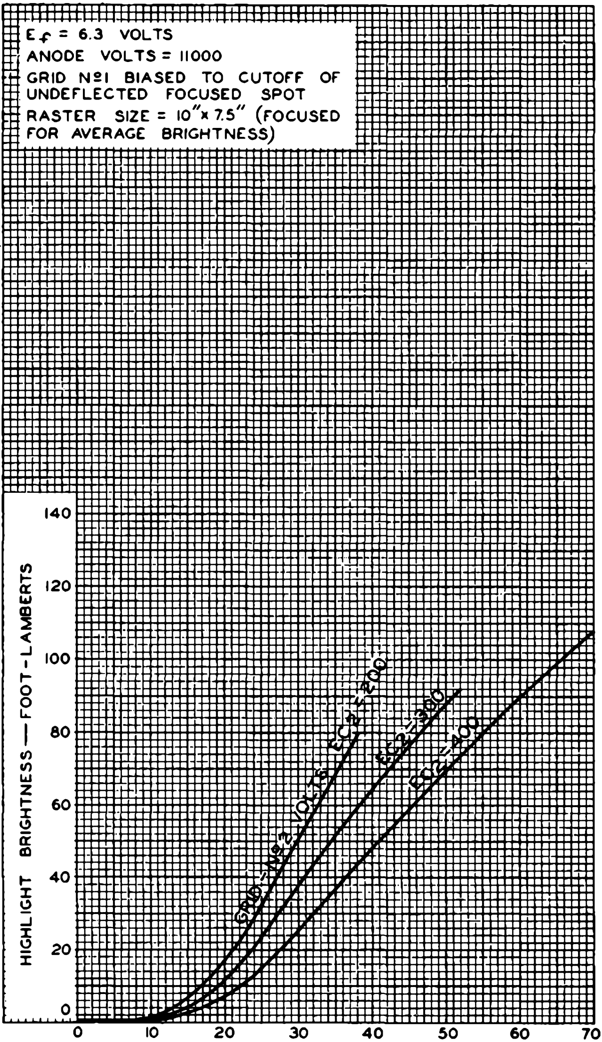
12LP4-A

12LP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 20, 1950

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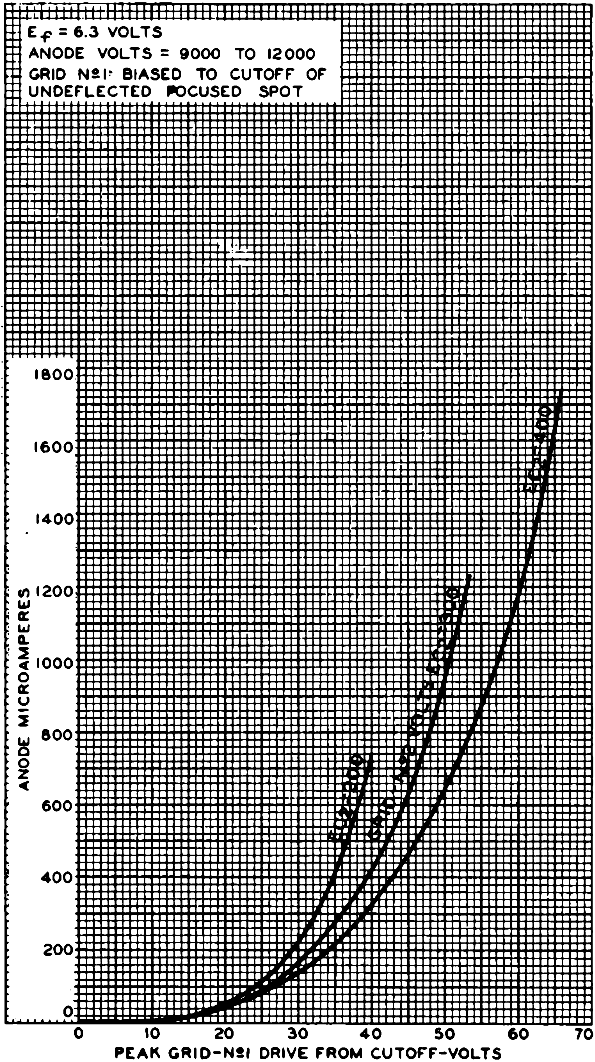
92CM-7453

12LP4-A

12LP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

14EP4/14CP4

KINESCOPE

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

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; 750 min. μμf}

Faceplate, Spherical . . . . Filterglass
- Light transmission (Approx.) 66%

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

Focusing Method . . . . Magnetic

Deflection Method . . . . Magnetic

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

Ion-Trap Gun . . . . . . .Requires External Single-Field Magnet

Tube Dimensions:
- Overall length . . . . 16-5/8" ± 1/4"
- Greatest width . . . . 12-17/32" ± 1/8"
- Greatest height . . . . 9-23/32" ± 1/8"
- Diagonal . . . . 13-11/16" ± 1/8"
- Neck length . . . . 7-5/16" ± 1/8"

Screen Dimensions (Minimum):
- Greatest width . . . . 11-3/8"
- Greatest height . . . . 8-1/2"
- Diagonal . . . . 12-1/2"
- Projected area . . . . 93 sq. in.

Weight (Approx.) . . . . 10 lbs

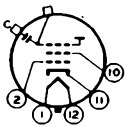
Mounting Position . . . . Any

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

Bulb J-109-1/2

Base . . . . .Small-Shell Duodecal 5-Pin (JETEC 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

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14EP4

14EP4

KINESCOPE

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

Equipment Design Ranges:

With any ultor voltage (E_{c_3}) between 10000* and 14000 volts and grid-No. 2 voltage (E_{c_2}) between 200 and 410 volts

Grid-No. 1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of E_{c_2}	volts
Grid-No. 1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	9.3% to 24% of E_{c_2}	volts
Grid-No. 2 Current	-15 to +15	μamp
Focusing-Coil Current (DC)°.	$\left[\sqrt{\frac{E_{c_3}}{14000}} \times 107\right] \pm 10\%$	ma
Ion-Trap Magnet Current (Average)**.	$\sqrt{\frac{E_{c_3}}{14000}} \times 28$	ma
Minimum Field Strength of PM Ion-Trap Magnet§. . . .	$\sqrt{\frac{E_{c_3}}{14000}} \times 31$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*12000*	*14000*	***volts***
and grid-No. 2 voltage of	*300*	*300*	***volts***
Grid-No. 1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-28 to -72	volts
Grid-No. 1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	28 to 72	28 to 72	volts
Focusing-Coil Current (DC) .	99 ± 10%	107 ± 10%	ma
Minimum Field Strength of PM Ion-Trap Magnet	29	31	gausses

*, °, **, §: see next page.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

14EP4

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 10000 volts.

o For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line *(See Dimensional Outline)*. The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 11-1/8" x 8-5/16" picture size.

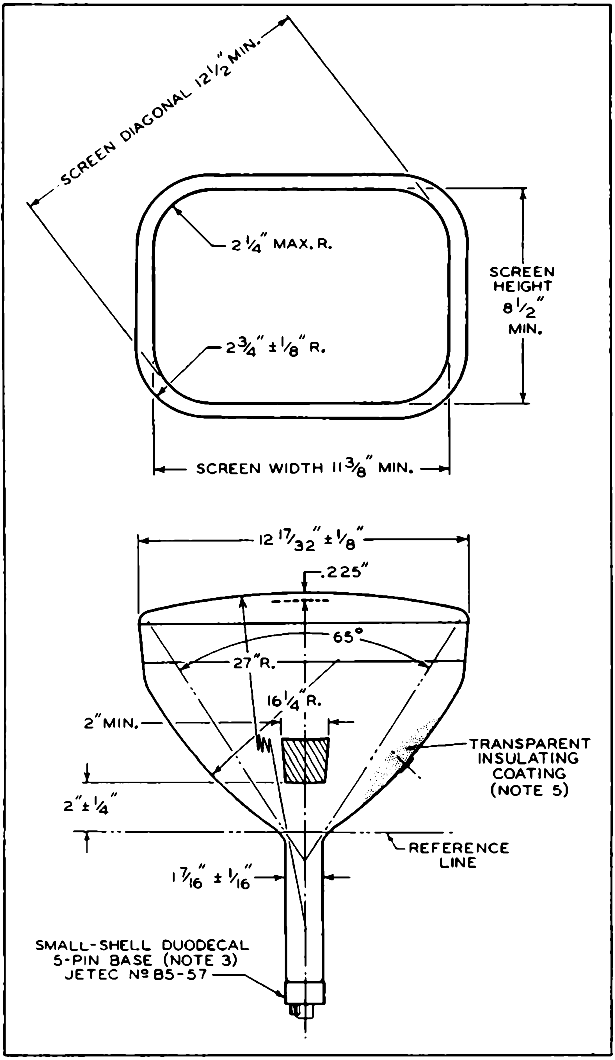
** For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

14EP4

KINESCOPE



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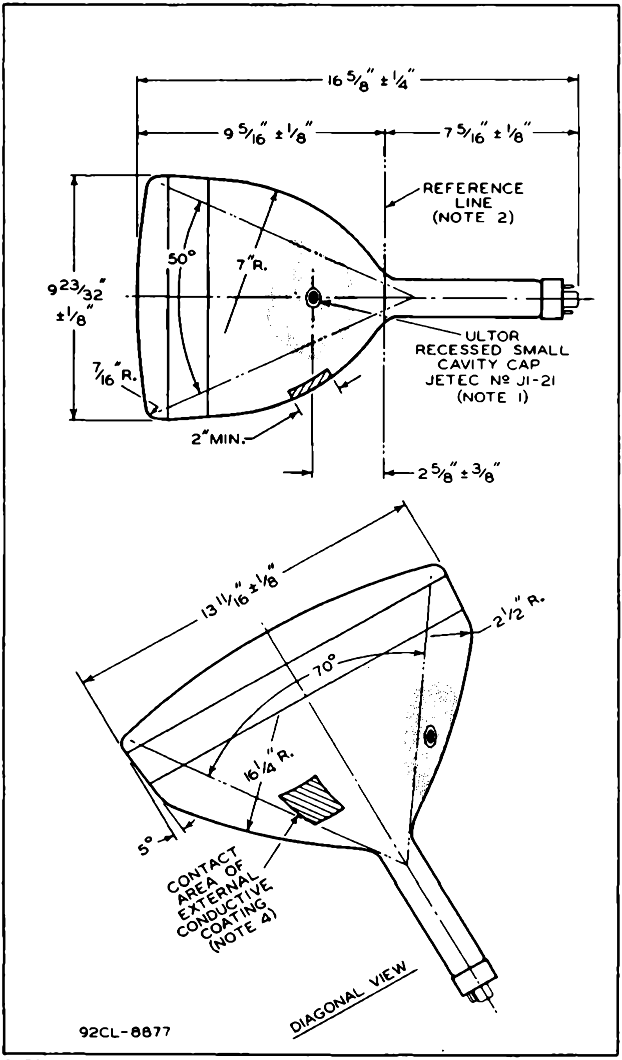
RCA

14EP4

KINESCOPE



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14EP4

KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.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 VACANT PIN POSITION No.6.

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

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-1/2".

NOTE 4: 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.

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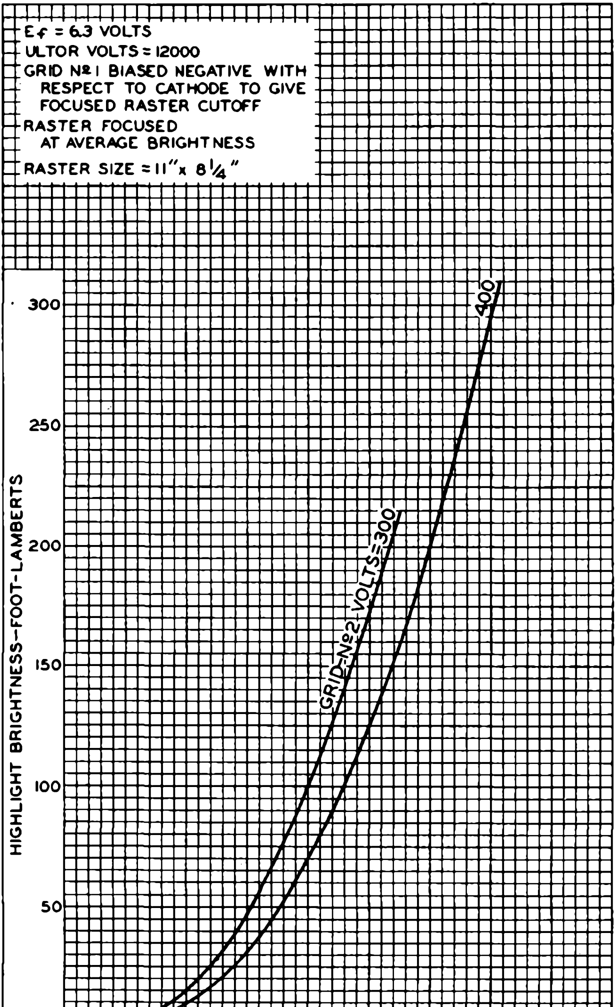
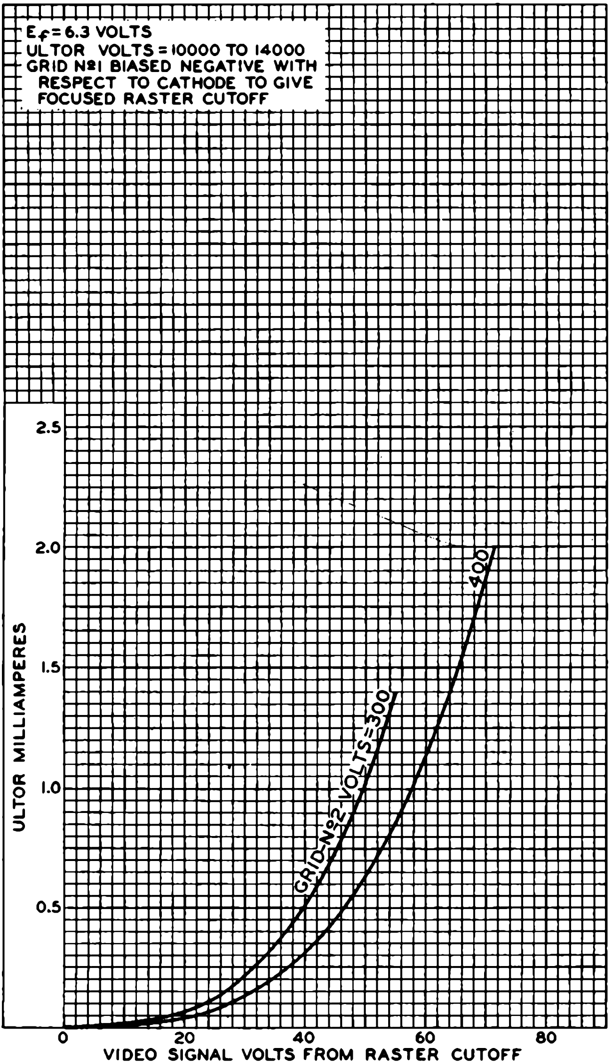
AVERAGE GRID-DRIVE CHARACTERISTICS



14EP4

14EP4

AVERAGE GRID-DRIVE CHARACTERISTICS



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92CM-8856

RCA

14HP4

KINESCOPE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS MAGNETIC DEFLECTION

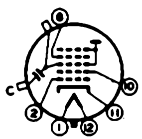
DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor●	2000 max.	μμf
	750 min.	μμf
Faceplate, Spherical	Filterglass	
Light Transmission (Approx.)	75%	
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type	
Fluorescence	White	
Phosphorescence	White	
Persistence	Short	
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	70°	
Horizontal	65°	
Vertical	50°	
Ion-Trap Gun	Requires External Single-Field Magnet	
Tube Dimensions:		
Overall length	16-25/32" ± 3/8"	
Greatest width	12-17/32" ± 1/8"	
Greatest height	9-23/32" ± 1/8"	
Diagonal	13-11/16" ± 1/8"	
Screen Dimensions (Minimum):		
Greatest width	11-1/8"	
Greatest height	8-5/16"	
Diagonal	12-1/4"	
Weight (Approx.)	10 lbs	
Mounting Position	Any	
Cap	Recessed Small Cavity (JETEC No.J1-21)	
Bulb	J109-1/2	
Base	Small-Shell Duodecal 6-Pin (JETEC No.B6-63)	

BOTTOM VIEW

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



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

●: See next page.

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RCA

14HP4

KINESCOPE

Maximum Ratings, *Design-Center Values:*

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

Equipment Design Ranges:

For any ultor voltage (E_{c5}) between 12000■ and 14000 volts and grid-No.2 voltage (E_{c2}) between 200 and 500 volts

Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp	-0.4% to +2.2% of E_{c5}	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of E_{c2}	volts
Grid-No.4 Current	-25 to +25	μamp
Grid-No.2 Current	-15 to +15	μamp
Field Strength of Single-Field Ion-Trap Magnet (Approx.)	$\sqrt{\frac{E_{c5}}{12000}} \times 32$	gausses
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	*300*	*300*	*volts*
Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp	-50 to +265	-55 to +310	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-28 to -72	volts
Field Strength of Ion-Trap Magnet	32	35	gausses

Maximum Circuit Values:

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

●,■: See next page.

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14HP4

KINESCOPE

● 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 14HP4, the ultor function is performed by grid No.5. Since grid No.5, grid No.3, and collector are connected together within the 14HP4, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.

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

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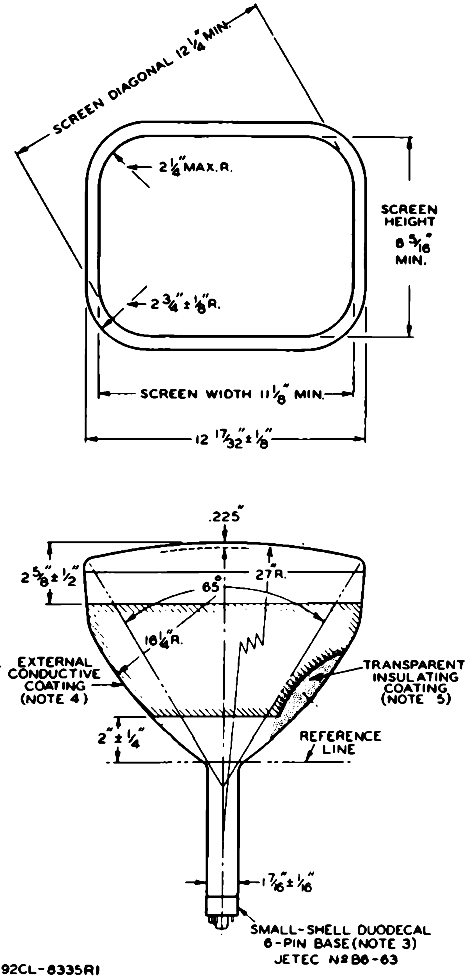
14HP4

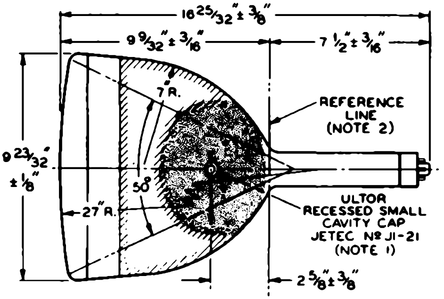
14HP4
KINESCOPE

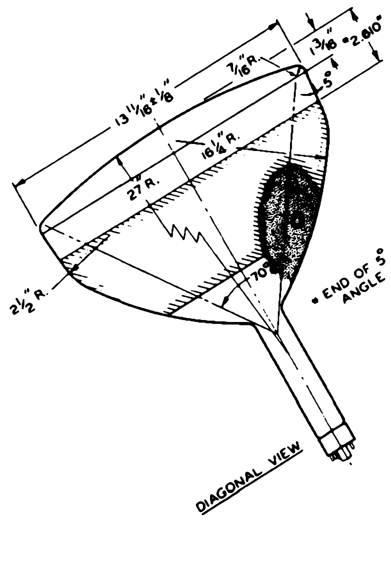


RCA

14HP4

KINESCOPE





14HP4
KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^{\circ}$. ULTOR TERMINAL IS ON SAME SIDE AS PIN No.6.

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

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-1/2".

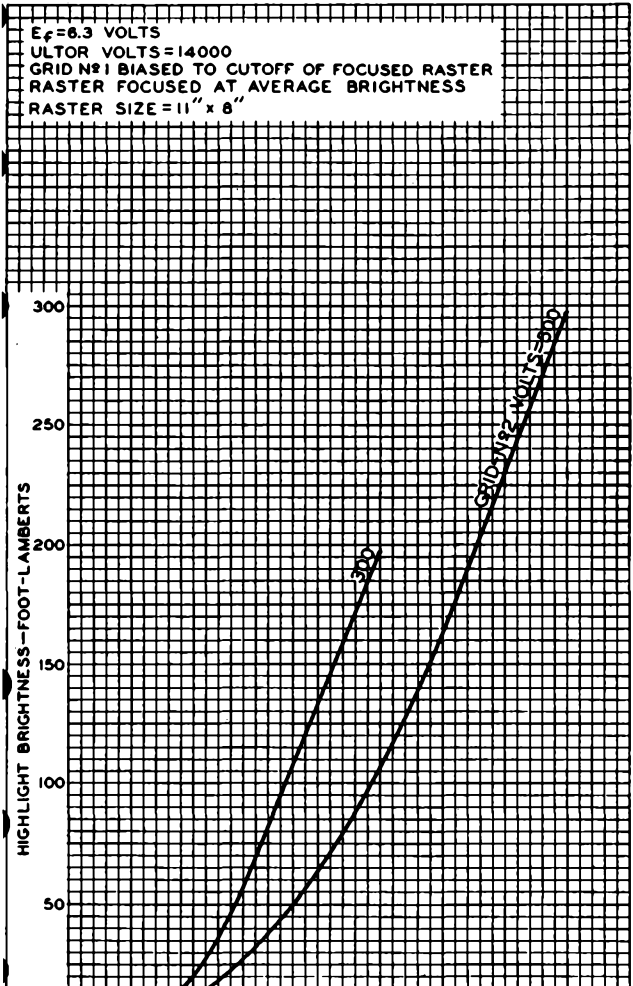
NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

RCA

14HP4

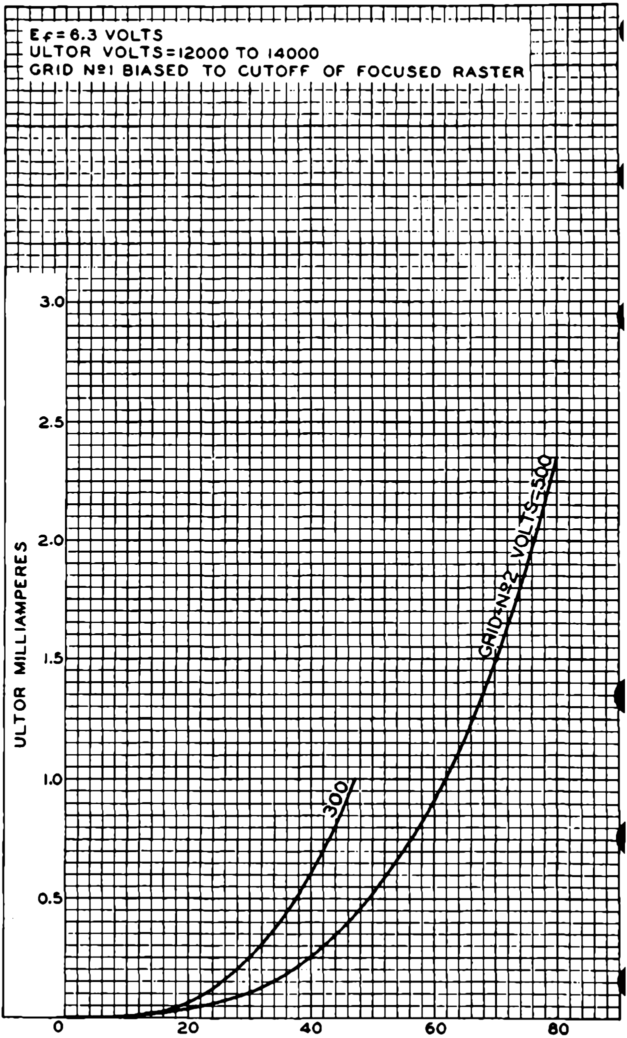
AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

14HP4

AVERAGE GRID-DRIVE CHARACTERISTICS



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

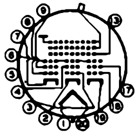
15GP22

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.

15GP22

TRICOLOR KINESCOPE

Grid-No.2 Voltage (Each Gun) when circuit design utilizes grid-No.1 Voltage (E_{c1}) at fixed value for raster cutoff (each gun) . . .	2 to 4.5 times E_{c1}	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster (Each Gun) when circuit design utilizes grid-No.2 voltage (E_{c2}) at fixed value (each gun)	22.5% to 50% of E_{c2}	volts
Grid-No.4 Current	-5 to +5	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

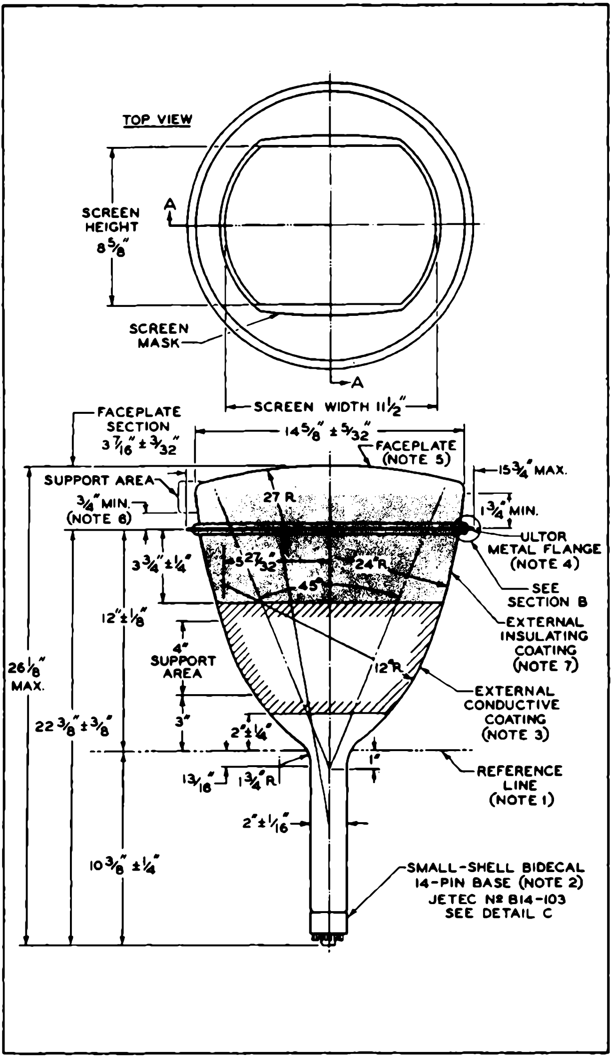
† This range does not include the dc component of the dynamic converging voltage.

□ 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.

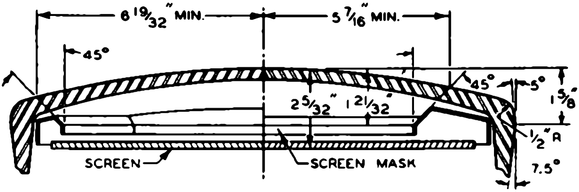
RCA

15GP22
TRICOLOR KINESCOPE

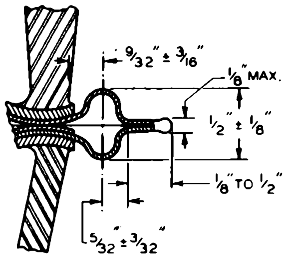


MARCH 1, 1954 CE-8072R1A

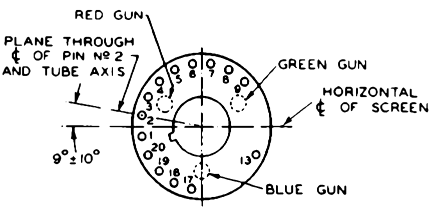
15GP22
TRICOLOR KINESCOPE



ENLARGED SECTION A-A



ENLARGED SECTION B



BASE DETAIL C
BOTTOM VIEW

92CL-8072R1

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

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.

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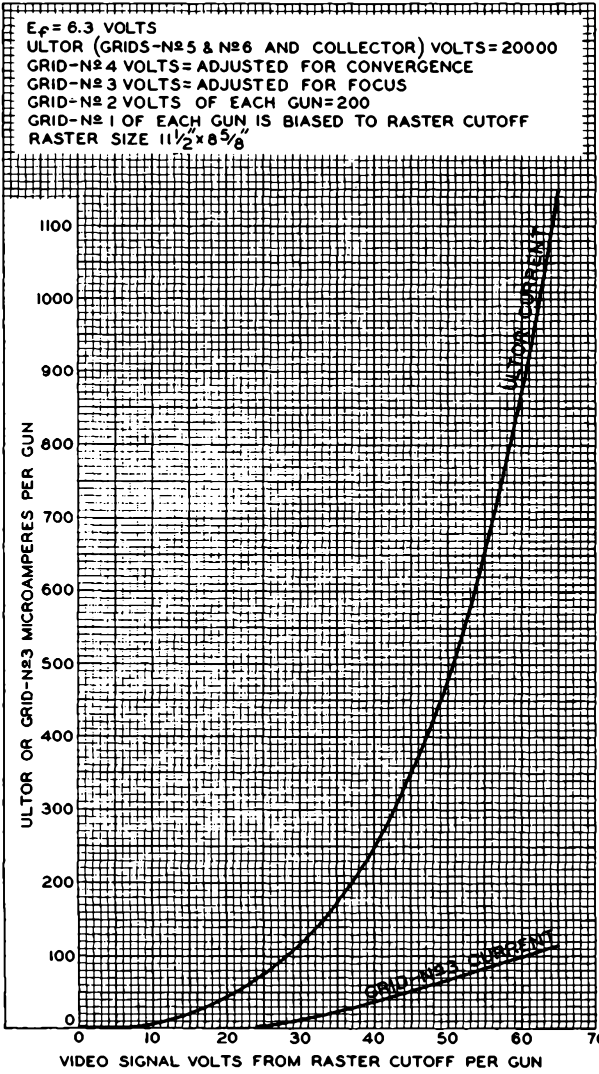
RCA

15GP22

15GP22

TYPICAL DRIVE CHARACTERISTIC



SEPT. 3, 1953

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92CM-8067

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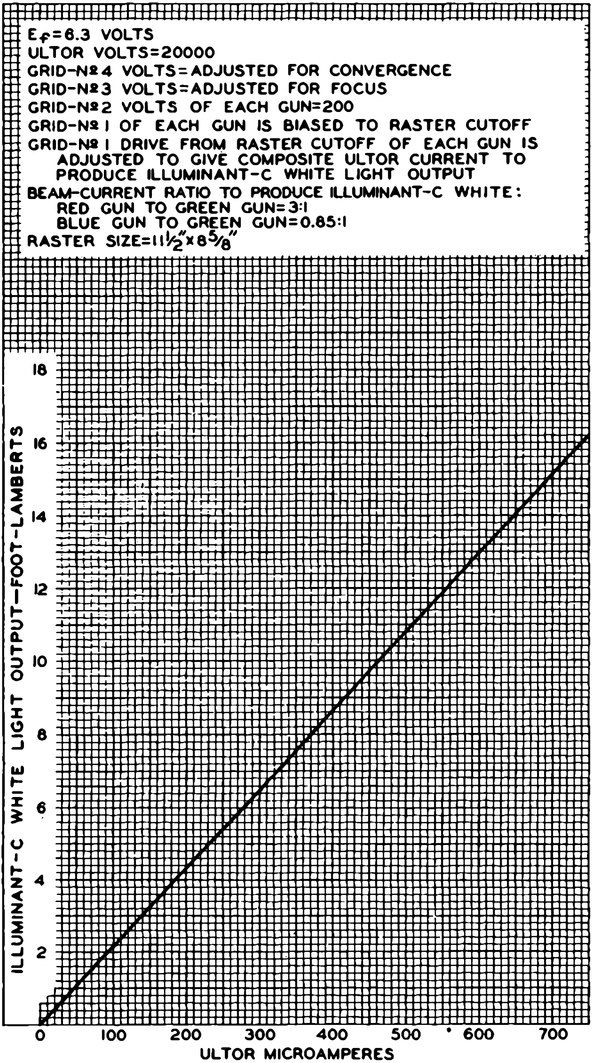
15GP22

TYPICAL LIGHT-OUTPUT CHARACTERISTIC



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

16ADP7

RCA

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

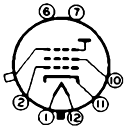
Direct Interelectrode Capacitances (Approx.):

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.

16ADP7

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

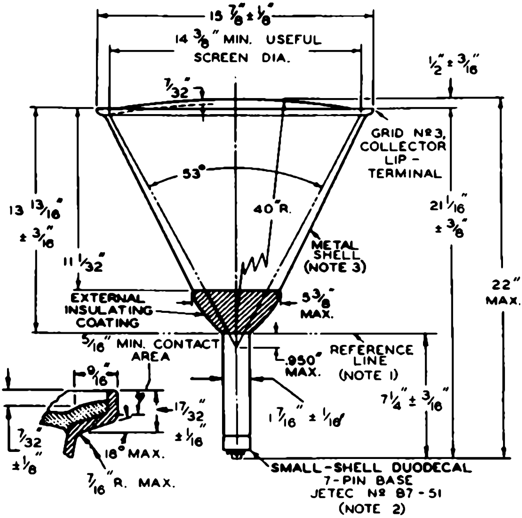
* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 8000 volts.

°° 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.

16ADP7

OSCILLOGRAPH TUBE



DETAIL OF LIP

92CM - 7690

NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE REFERENCE-LINE GAUGE (JETEC No. 112) 1.500" + 0.003" - 0.000" I.D. AND 2" LONG WILL REST ON FUNNEL.

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

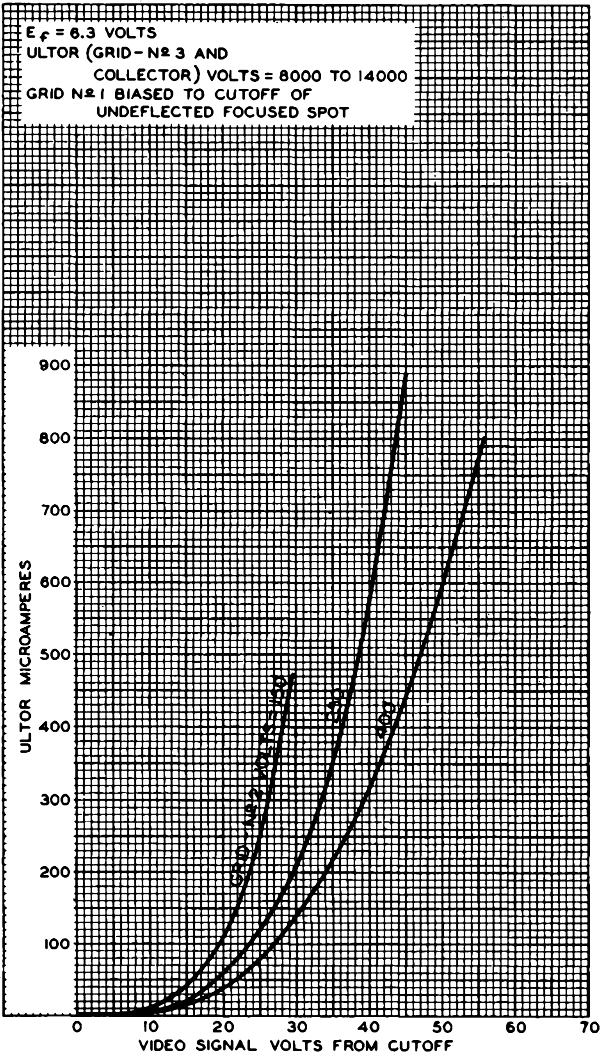
NOTE 3: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST BE INSULATED TO WITHSTAND THE MAXIMUM APPLIED ULTOR VOLTAGE.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

16ADP7

16ADP7

AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

16AP4-A

KINESCOPE

METAL-CONE ENVELOPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

Supersedes Type 16AP4

DATA

General:

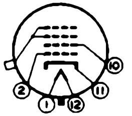
Heater, for Unipotential Cathode:
- Voltage . . . . 6.3 . . . . . ac or dc volts
- Current . . . . 0.6 . . . . amp

Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to All Other Electrodes . . . . . 6 $\mu\mu$f
- Cathode to All Other Electrodes . . . . . 5 $\mu\mu$f

Face Plate (Transmission of about 65%) . . . RCA "Filterglass"
Phosphor (For Curves, see front of this Section) No.4–Sulfide Type
- Fluorescence and Phosphorescence . . . . White
- Persistence of Phosphorescence . . . . Medium

Focusing Method . . . . Magnetic
Deflection Method . . . . Magnetic
Deflection Angle (Approx.) . . . . 53°
Ion-Trap Gun . . . . . Requires External Double-Field Magnet
Maximum Overall Length . . . . 22-5/16"
Greatest Diameter of Bulb . . . . 15-7/8" ±1/8"
Screen Diameter . . . . 14-5/8"
Mounting Position . . . . Any
Anode Terminal . . . . Metal-Cone Lip
Base . . . . Small-Shell Duodecal 5-Pin
- Basing Designation for BOTTOM VIEW . . . . $12D_1$

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



Pin 12 - Heater
Metal-Cone Lip: Anode, Grid No.3

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

ANODE□ 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

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

○ The product of anode voltage and average anode current should be limited to 6 watts.

16AP4-A

KINESCOPE

Typical Operation:

Anode Voltage*	9000	12000	volts
Grid-No.2 Voltage	300	300	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-33 to -77	-33 to -77	volts
Focusing-Coil Current (DC)▲	75	90	ma
Ion-Trap Magnet Current (DC, approx.)#	155	200	ma

Maximum Circuit Values:

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

Minimum Circuit Values:

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

Grid-No.1-Circuit Resistance	150 min.	ohms
Grid-No.2-Circuit Resistance	470 min.	ohms
Anode-Circuit Resistance	16000 min.	ohms

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

Components:

Horizontal-Deflection-Output and High-Voltage Transformer: For use with pulse-operated high-voltage supply giving 11500-13500 volts	RCA-211T5
Horizontal Linearity Control	RCA-201R5
Width Control	RCA-201R4
Vertical-Deflection Output Transformer	RCA-204T9
Deflecting Yoke	RCA-201D12
Ion-Trap Magnet (Permanent-Magnet Type)	RCA-203D3
Focusing Coil°°	RCA-202D2

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

▲ For JETEC Focusing Coil No.109, or equivalent, positioned with air gap toward kinescope screen, and center line of air gap about 3 inches from Reference Line (see Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 13-1/4" x 10" picture area.

\# For JETEC Ion-Trap Magnet No.108, or equivalent, located with main pole pieces longitudinally opposite internal pole pieces, and rotated to give maximum brightness.

°° Renewal Sales item only.

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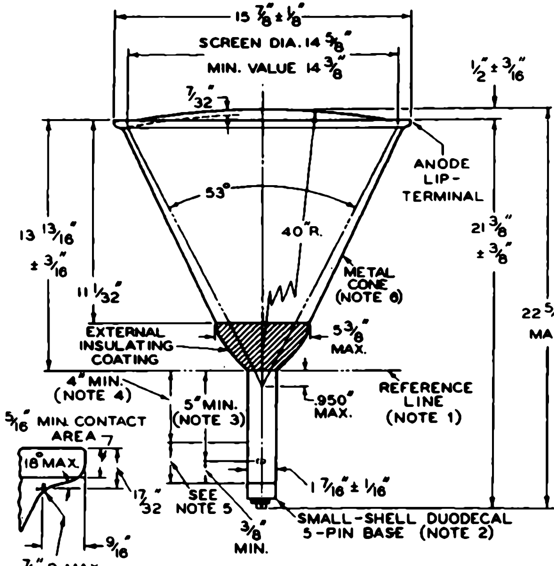
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

16AP4-A

KINESCOPE



NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + .003" - .000" I.D. AND 2" LONG WILL REST ON CONE.

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 CONE AXIS AND HAVING DIAMETER OF 3".

NOTE 3: DISTANCE TO INTERNAL POLE PIECES. PLANE THROUGH VACANT PIN POSITION No.6 AND TUBE AXIS PASSES THROUGH LINE JOINING CENTERS OF POLE PIECES. DIRECTION OF PRINCIPAL FIELD OF ION-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO VACANT PIN POSITION No.6 AND SOUTH POLE TO PIN No.12.

NOTE 4: LOCATION OF DEFLECTING YOKE AND FOCUSING-COIL MUST BE WITHIN THIS SPACE.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

16AP4-A
KINESCOPE

NOTE 5: KEEP THIS SPACE CLEAR FOR ION-TRAP MAGNET.

NOTE 6: METAL CONE AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE CONE OR THE FACE MUST HAVE INSULATING PROPERTIES ADEQUATE FOR 15500 VOLTS.

CURVES

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

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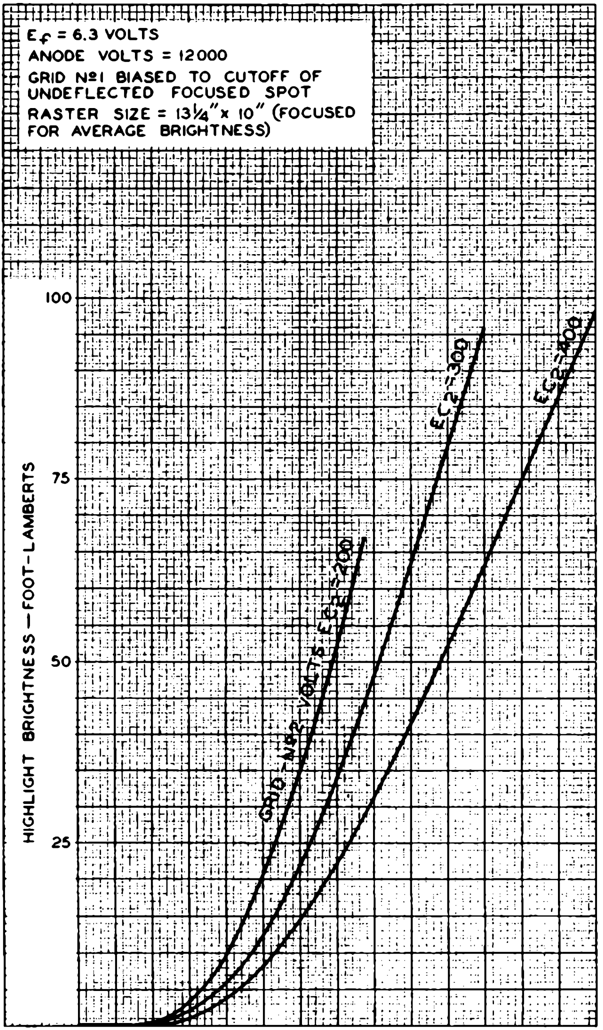
RCA

16AP4-A

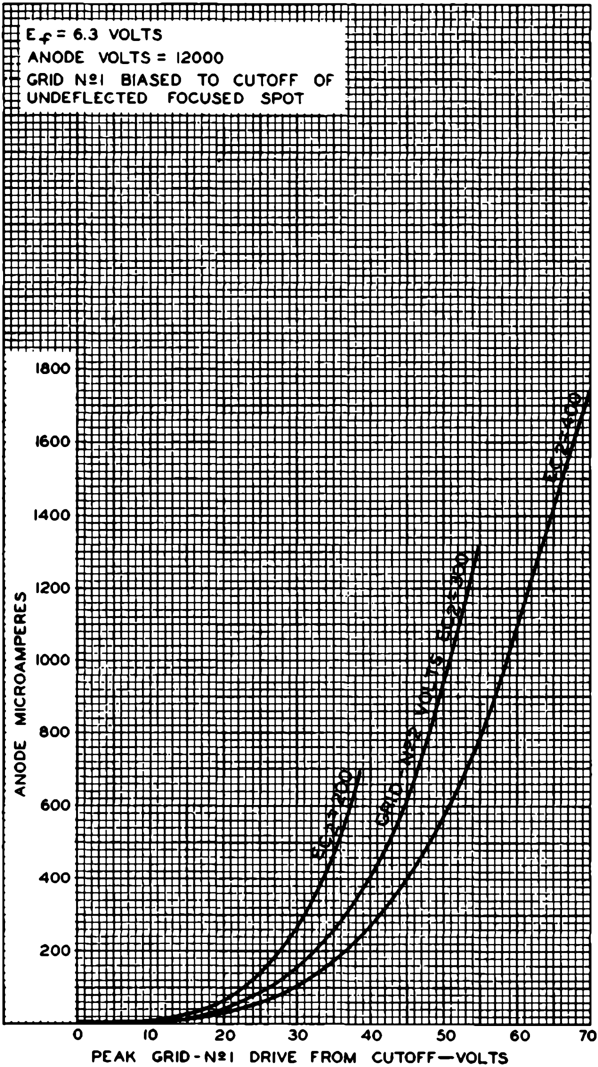
AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

16AP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



MAR. 25, 1950

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6999R1

16DP4-A

16DP4-A
KINESCOPE

ROUND GLASS TYPE

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 . . . $\mu\mu f$
- Cathode to All Other Electrodes . . . . 5 . . . $\mu\mu f$

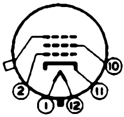
Faceplate, Spherical . . . . Filterglass
- Light Transmission (Approx.) 66%

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

Focusing Method . . . . Magnetic
Deflection Method . . . . Magnetic
Deflection Angle (Approx.) . . . . 60^{o}
Ion-Trap Gun . . . . . Requires External Double-Field Magnet
Overall Length . . . . 20-3/4" ± 1/4"
Greatest Diameter of Bulb . . . . 15-7/8" ± 1/8"
Minimum Screen Diameter . . . . 14-1/2"
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 - Anode

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

ANODE 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

Typical Operation:

Anode Voltage*	12000	volts

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

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

16DP4-A

KINESCOPE

Grid-No.2 Voltage.	250	volts
Grid-No.1 Voltage°	-27 to -63	volts
Focusing-Coil Current (DC, Approx.)† . .	115	ma
Ion-Trap-Magnet Current (DC, Approx.)# .	110	ma

Maximum Circuit Values:

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

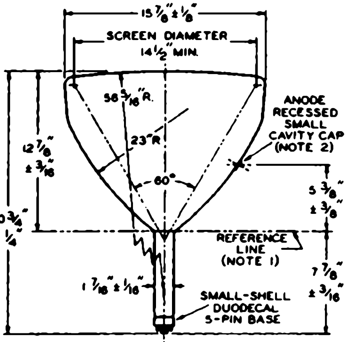
° For visual extinction of undeflected, focused spot.

† For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3-1/4 inches from Reference Line (see Outline Drawing). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 20 foot-lamberts on a 14-1/2" x 10-1/4" picture area sharply focused at center of screen.

For specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No.108 located in optimum position and rotated to give maximum brightness.

OPERATING NOTES

X-Ray Warning. When operated at anode voltages up to 16 kilovolts, the 16DP4-A does not produce any harmful x-ray radiation. However, because the rating of the tube permits operation at voltages as high as 16.5 kilovolts (absolute value), shielding of the 16DP4-A 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.



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 BULB CONE.

NOTE 2: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.

16GP4-B

16GP4-B

KINESCOPE

ROUND METAL-SHELL TYPE

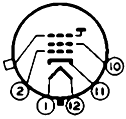
MAGNETIC FOCUS | MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
  Voltage . . . . 6.3 . . . . ac or dc volts
  Current . . . . 0.6 ± 10% . . . . amp ←
Direct Interelectrode Capacitances:
  Grid No.1 to all other electrodes . . . . . . 6 μμf
  Cathode to all other electrodes . . . . 5 μμf
Faceplate, Spherical . . . . Frosted Filterglass
  Light transmission (Approx.) . . . . 66% ←
Phosphor (For curves, see front of this section) . . P4—Sulfide Type
  Fluorescence . . . . White
  Phosphorescence . . . . White
    Persistence . . . . Short ←
Focusing Method . . . . Magnetic
Deflection Method . . . . Magnetic
Deflection Angle (Approx.) . . . . 70°
Ion-Trap Gun . . . . . . Requires External Single-Field Magnet
Tube Dimensions:
  Maximum overall length . . . . 17-11/16"
  Greatest diameter . . . . 15-7/8" ± 1/8"
Minimum Useful Screen Diameter . . . . 14-3/8" ←
Weight (Approx.) . . . . 11 lbs ←
Mounting Position . . . . Any
Ultor Terminal . . . . Metal-Shell Lip
Base . . . . Small-Shell Duodecal 5-Pin (JETEC 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

← Indicates a change.

RCA

16GP4-B

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→ **Equipment Design Ranges:**

With any ultor voltage (Ec_3) between 12000 and 14000 volts and grid-No.2 voltage (Ec_2) between 200 and 410 volts*

Grid-No.1 Voltage for Visual Extinction of Focused Raster.	−9.3% to −24% of Ec_2	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	9.3% to 24% of Ec_2	volts
Grid-No.2 Current	−15 to +15	μamp
Focusing-Coil Current (DC)° . .	$\left[\sqrt{\frac{Ec_3}{14000}} \times 107\right] \pm 10\%$	ma
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{Ec_3}{14000}} \times 28$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{Ec_3}{14000}} \times 31$	gausses
Field Strength of Adjustable Centering Magnet.	0 to 8	gausses

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

With ultor voltage of	*12000*	*volts*
and grid-No.2 voltage of	*300*	*volts*
Grid-No.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
Focusing-Coil Current (DC). .	99 ± 10%	ma
Minimum Field Strength of PM Ion-Trap Magnet.	29	gausses

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.

° For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line *(See Dimensional Outline)*. The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 10" x 13-1/4" picture size.

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

§ See next page.

→ Indicates a change.

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KINESCOPE

Maximum Circuit Values:

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

§ For specimen PM ion-trap magnet, such as Heppner Model No. E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

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16GP4-B

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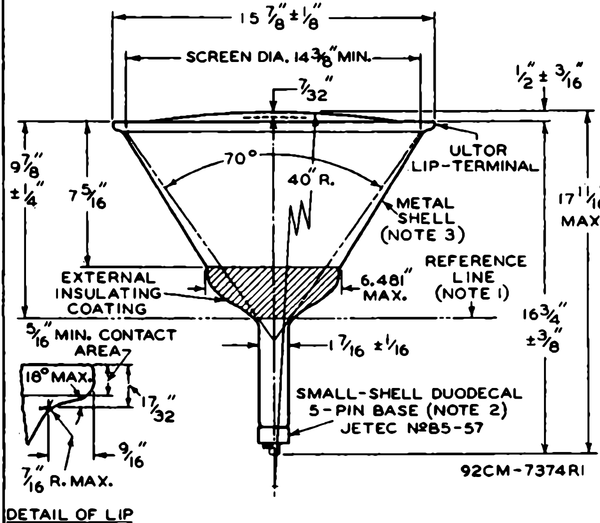


NOTE 1: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No. 110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

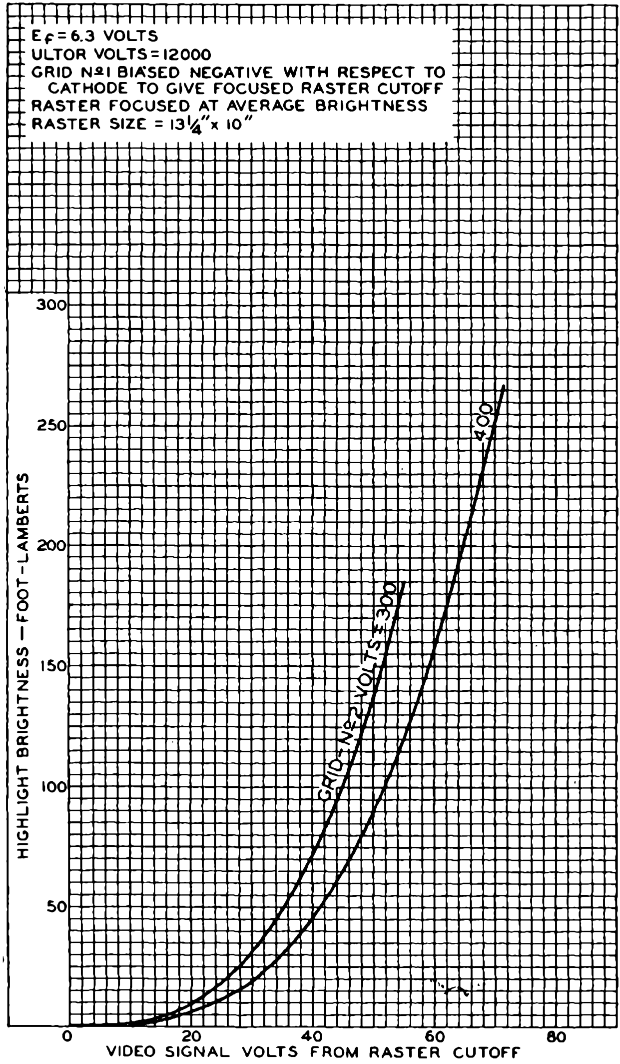
NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-1/2".

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.

RCA

16GP4-B

AVERAGE GRID-DRIVE CHARACTERISTICS



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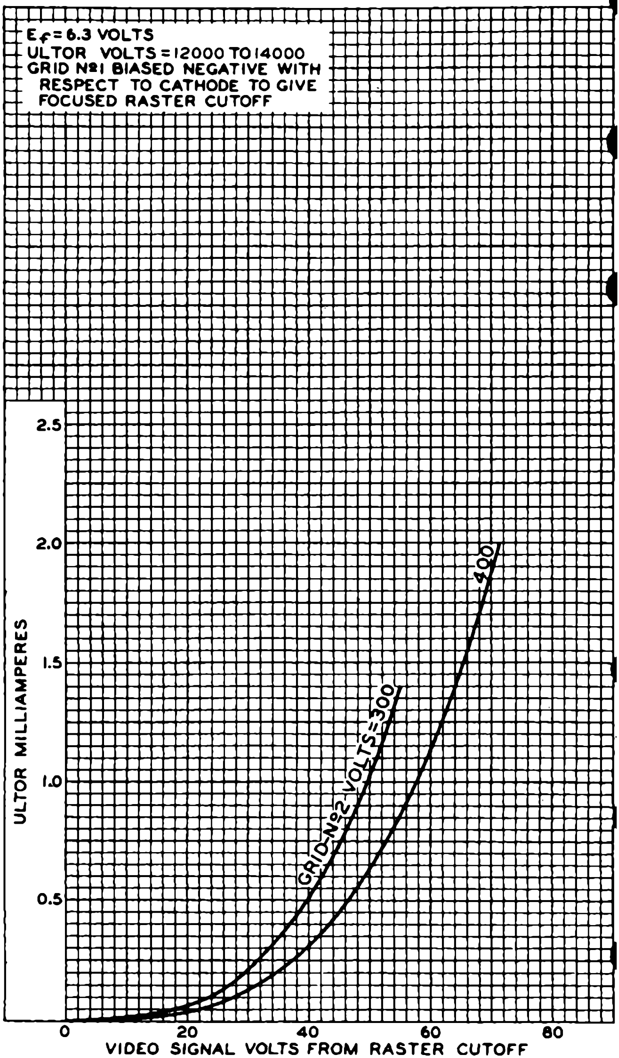
AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

16LP4-A
KINESCOPE

ROUND GLASS TYPE

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 . . . . . 6 . . . μμf
- Cathode to All Other Electrodes . . . . . 5 . . . μμf
- External Conductive Coating to Anode . . . 2000 max. μμf / 750 min. μμf

Faceplate, Spherical . . . . Filterglass
- Light Transmission (Approx.) 66%

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

Focusing Method . . . . Magnetic

Deflection Method . . . . Magnetic

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

Ion-Trap Gun . . . . . Requires External Double-Field Magnet

Overall Length . . . . 22-1/4" ± 3/8"

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

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

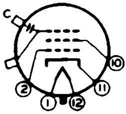
Mounting Position . . . . Any

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 – Anode
C – External Conduct. Coating

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

ANODE 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

Typical Operation:

Anode Voltage . . . . 12000 volts

16LP4-A
KINESCOPE

Grid-No.2 Voltage.	300	volts
Grid-No.1 Voltage°	-33 to -77	volts
Focusing-Coil Current (DC, Approx.)▲ .	110	ma
Ion-Trap-Magnet Current (DC, Approx.)# .	120	ma

Maximum Circuit Values:

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

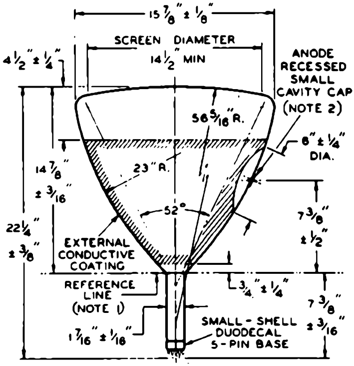
° For visual extinction of undeflected focused spot.

▲ For specimen focusing coil similiar to JETEC Focusing Coil No.106 positioned with air gap toward kinescope screen, and center line of air gap about 3-1/4" inches from Reference Line (see Outline Drawing). The indicated current is for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 20 foot-lamberts on a 14-1/2" x 10-1/4" picture area sharply focused at center of screen.

\# For specimen ion-trap magnet similiar to JETEC Ion-Trap Magnet No.10 located in optimum position and rotated to give maximum brightness.

OPERATING NOTES

X-Ray Warning. When operated at or below the maximum anode-voltage rating shown in the tabulated data, the 16LP4-A does not produce any harmful x-ray radiation. All types of picture tubes may be operated at voltages (if ratings permit) up to 16 kilovolts (absolute value) without personal injury on prolonged exposure at close range. Above 16 kilovolts, special shielding precautions for x-ray radiation may be necessary.



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 BULB CONE.

NOTE 2: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION NO.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ±10°. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION NO.3.

RCA

16RP4 / 16KP4

KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS MAGNETIC DEFLECTION

The 16RP4/16KP4 is the same as the 16RP4-A/16KP4-A except that it utilizes a *non-aluminized phosphor* and has a light output as shown by the curves on the back of this sheet.

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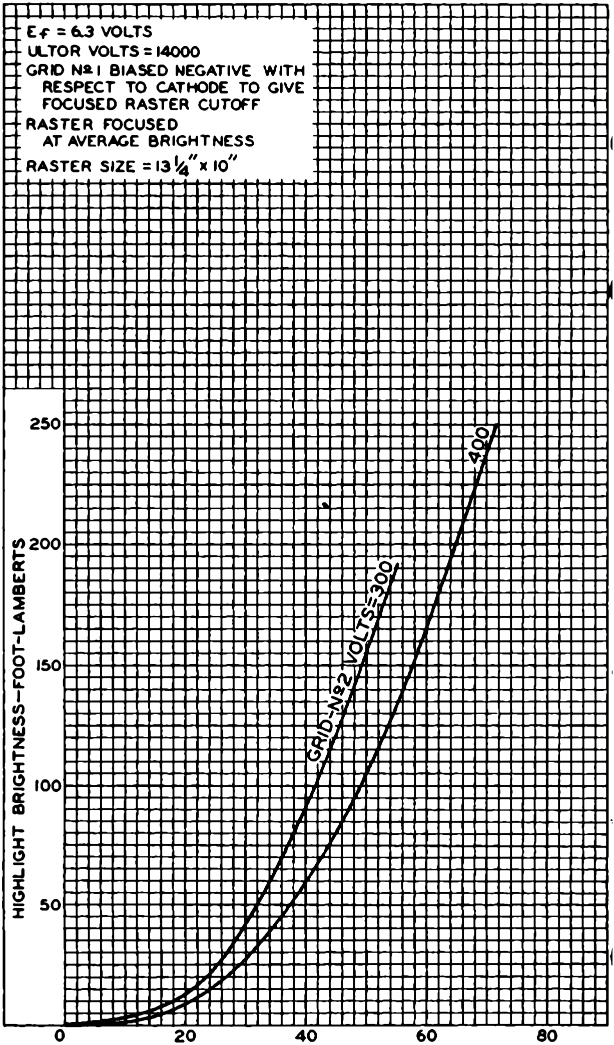
16RP4

AVERAGE GRID-DRIVE CHARACTERISTICS



92CM-8858

16RP4-A/16KP4-A

KINESCOPE

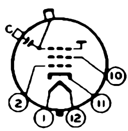
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp
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 750 min. μμf
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	66%
Phosphor (For curves, see front of this section)	P4--Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	70°
Horizontal	65°
Vertical	50°
Ion-Trap Gun	Requires External Single-Field Magnet
Tube Dimensions:	
Overall length	18-3/4" ± 3/8"
Greatest width	14-3/4" ± 1/8"
Greatest height	11-1/2" ± 1/8"
Diagonal	16-1/8" ± 1/8"
Neck length	7-1/2" ± 3/16"
Screen Dimensions (Minimum): -	
Greatest width	13-1/2"
Greatest height	10-1/8"
Diagonal	14-7/8"
Projected area	131 sq. in.
Weight (Approx.)	16 lbs
Mounting Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Bulb	J129
Base	Small-Shell Duodecal 5-Pin (JETEC 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

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16RP4-A
KINESCOPE

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

Equipment Design Ranges:

With any ultor voltage (E_{c_3}) between 12000* and 16000 volts and grid-No.2 voltage (E_{c_2}) between 200 and 410 volts

Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of E_{c_2}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	9.3% to 24% of E_{c_2}	volts
Grid-No.2 Current	-15 to $+15$	μamp
Focusing-Coil Current (DC)°	$\left[\sqrt{\frac{E_{c_3}}{16000}} \times 115\right] \pm 20\%$	ma
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_3}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_3}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*12000*	*14000*	*volts*
and grid-No.2 voltage of	*300*	*300*	*volts*
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	28 to 72	28 to 72	volts
Focusing-Coil Current (DC)	100 ± 20%	108 ± 20%	ma
Minimum Field Strength of PM Ion-Trap Magnet	29	31	gausses

*,o,**,§: See next page.

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16RP4-A

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 12000 volts.

° For specimen focusing coil similar to JETEC Focusing Coil No. 109 positioned with air gap toward kinescope screen and center line of air gap 3-1/2 inches from Reference Line *(See Dimensional Outline)*. The indicated current is for condition with sharp focus at center of picture area and combined grid-No. 1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 13-1/2" x 10-1/8" picture size.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No. E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

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16RP4-A

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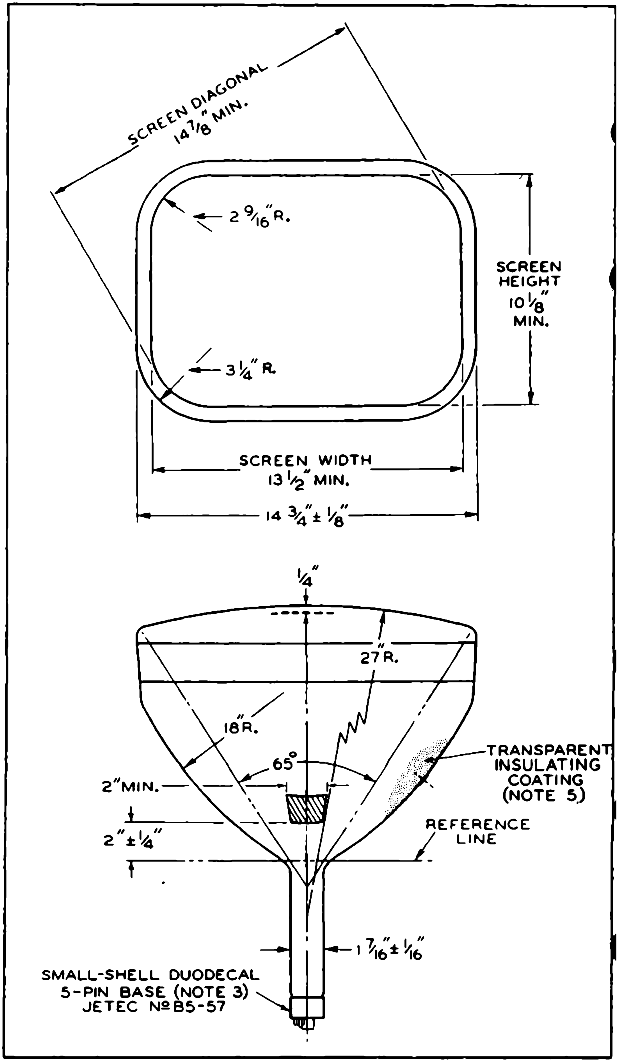

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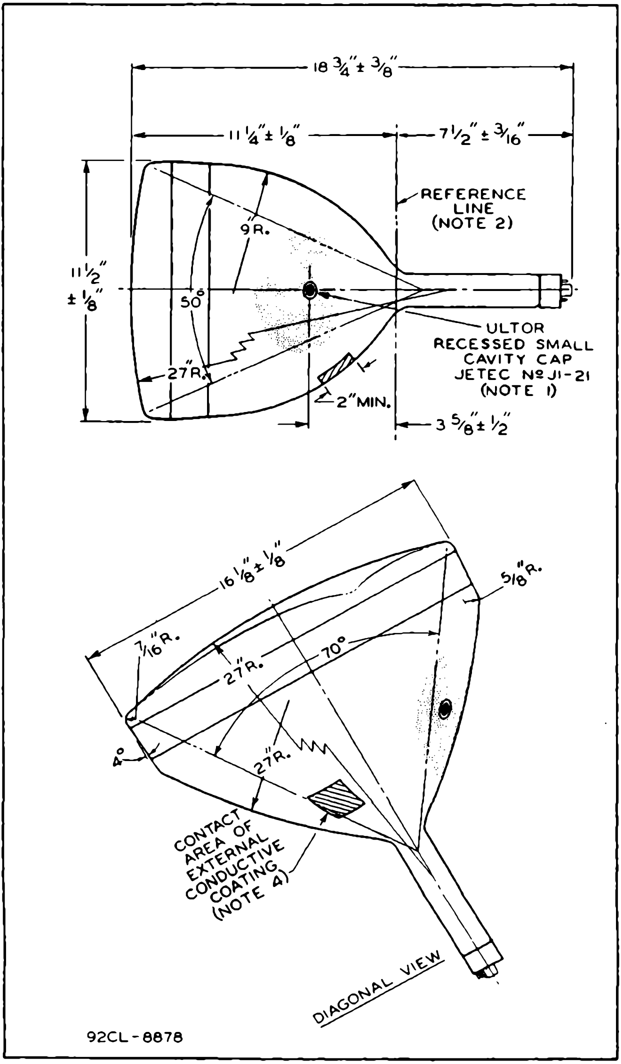
KINESCOPE

16RP4-A



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RCA

16RP4-A
KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.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 VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No. 110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE 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.

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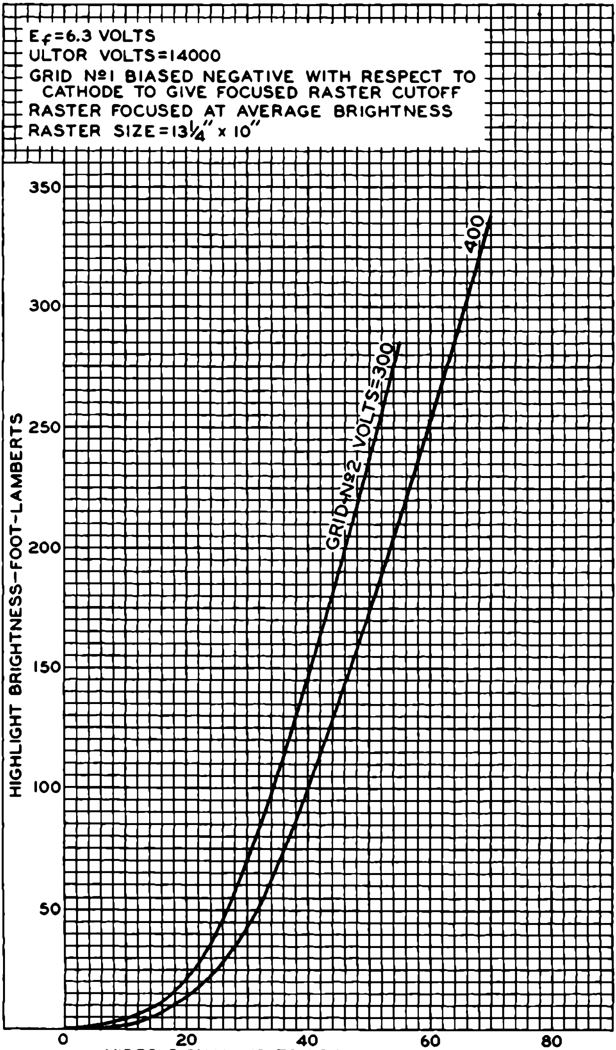
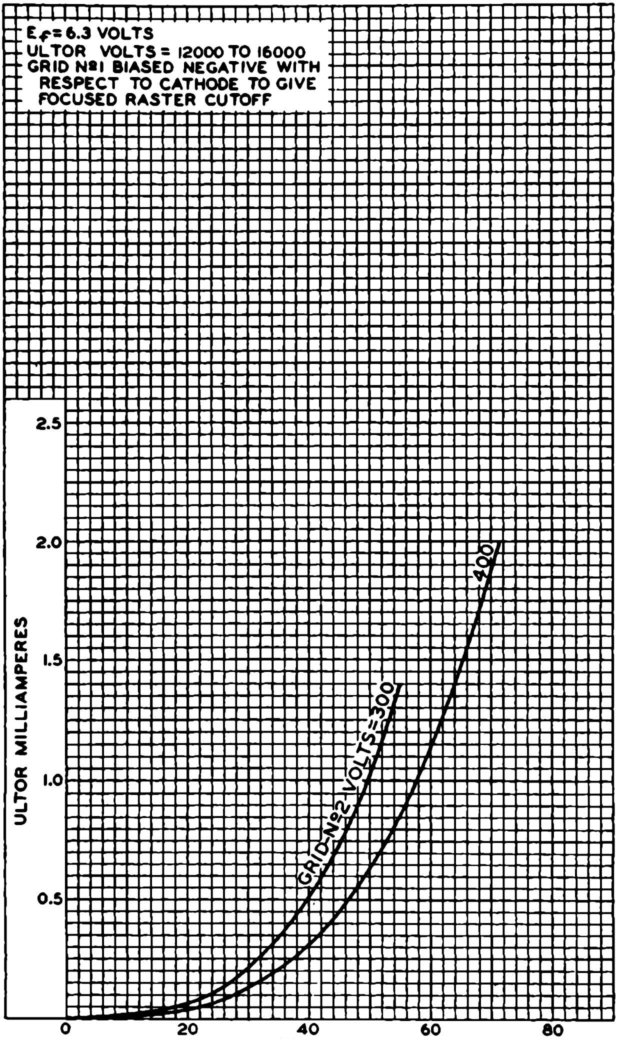
16RP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



16RP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



16WP4-A
KINESCOPE

ROUND GLASS TYPE

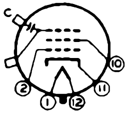
MAGNETIC FOCUS MAGNETIC DEFLECTION

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	6	$\mu\mu f$
Cathode to All Other Electrodes	5	$\mu\mu f$
External Conductive Coating to Anode	1500 max.	$\mu\mu f$
	750 min.	$\mu\mu f$
Faceplate, Spherical		Filterglass
Light Transmission		66%
Phosphor (For Curves, see front of this Section)		P4-Sulfide Type
Fluorescence and Phosphorescence		White
Persistence of Phosphorescence		Short
Focusing Method		Magnetic
Deflection Method		Magnetic
Deflection Angle (Approx.)		70°
Ion-Trap Gun		Requires External Double-Field Magnet
Overall Length		17-3/4" ± 3/8"
Greatest Diameter of Bulb		15-7/8" ± 1/8"
Minimum Screen Diameter		14-1/2"
Mounting Position		Any
Cap		Recessed Small Cavity (JETEC No. J1-21)
Base		Small-Shell Duodecal 5-Pin (JETEC No. B5-57)

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



Pin 12 - Heater
Cap - Anode
C - External Conduct. Coating

Maximum Ratings, *Design-Center Values*:

ANODE 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

Typical Operation

Anode Voltage	12000	volts
Grid-No.2 Voltage	250	volts

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16WP4-A

KINESCOPE

Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot.	-27 to 63	volts
Focusing-Coil Current (DC, Approx.)° . .	100	ma
Ion-Trap Current (Approx.)†	120	ma

Maximum Circuit Values:

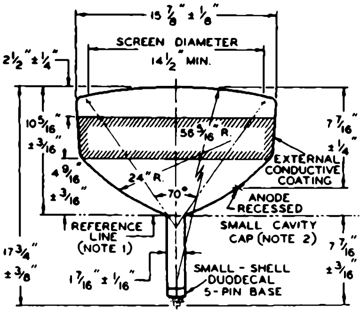
Grid-No.1-Circuit Resistance	1.5 max.	megohms

° For specimen focusing coil similar to JETEC Focusing Coil No.106 positioned with air gap toward kinescope screen and center line of air gap 3-1/4 inches from Reference Line (see Outline Drawing). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 20 foot-lamberts on a 14-1/2" x 10-1/4" picture area sharply focused at center of screen.

† For specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No.108 located in optimum position and rotated to give maximum brightness.

OPERATING NOTES

X-Ray Warning. When operated at anode voltages up to 16 kilovolts, the 16WP4-A does not produce any harmful x-ray radiation. However, because the rating of the tube permits operation at anode voltages as high as 17.6 kilovolts (absolute value), shielding of the 16WP4-A 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.



NOTE 1: 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 THE INTERSECTION OF THE PLANE C--' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 2: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.

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17AVP4

17AVP4/17ATP4
KINESCOPE

RECTANGULAR GLASS TYPE

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. . . . 1500 max. $\mu\mu$f / 1200 min. $\mu\mu$f

Faceplate, Spherical . . . . Filterglass
- Light transmission (Approx.) 74%

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

Focusing Method. . . . . .Electrostatic

Deflection Method. . . . . Magnetic

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

Ion-Trap Gun . . . . . . .Requires External Single-Field Magnet

Tube Dimensions:
- Overall length . . . . 15-5/8" ± 3/8"
- Greatest width . . . . 15-25/64" ± 1/8"
- Greatest height. . . . . .12-9/32" ± 1/8"
- Diagonal . . . . 16-5/8" ± 1/8"
- Neck length. . . . . 6-1/2" ± 3/16"

Screen Dimensions (Minimum):
- Greatest width . . . . 14-5/16"
- Greatest height. 11-1/8"
- Diagonal . . . . 15-9/16"
- Projected area . . . . 149 sq. in.

Weight (Approx.) . . . . 15 lbs

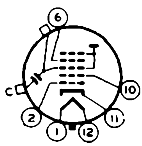
Mounting Position. . . . . .Any

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

Bulb J-133

Base . . . . .Small-Shell Duodecal 6-Pin (JETEC No.B6-63)
- Basing Designation for BOTTOM VIEW. 12L

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



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

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17AVP4/17ATP4
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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	16000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	200 max.	volts
Negative bias value	140 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Equipment Design Ranges:

With any ultor voltage (E_{c_5k}) between 12000# and 16000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp	−0.4% to +2.2% of E_{c_5k}	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	−9.3% to −24% of E_{c_2k}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	9.3% to 24% of E_{c_2k}	volts
Grid-No.4 Current	−25 to +25	μamp
Grid-No.2 Current	−15 to +15	μamp
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_5k}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_5k}}{16000}} \times 33$	gausses
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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Examples of Use of Design Ranges:

With ultor voltage of	*14000*	*16000*	*volts*
and grid-No.2 voltage of	*300*	*300*	*volts*
Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp . . .	-55 to +310	-65 to +350	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster.	-28 to -72	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	28 to 72	28 to 72	volts
Minimum Field Strength of PM Ion-Trap Magnet. . . .	31	33	gausses

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE.	16000 max.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	640 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive peak value	200 max.	volts
Positive bias value	140 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode .	180 max.	volts

■ 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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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 220 and 640 volts

Grid-No.4-to-Grid-No.1 Voltage for Focus with Ultor Current of 100 μamp	0% to 2.6% of $E_{c_5g_1}$	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	8.5% to 19.4% of $E_{c_2g_1}$	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak negative)	8.5% to 19.4% of $E_{c_2g_1}$	volts
Grid-No.4 Current	-25 to +25	μamp
Grid-No.2 Current	-15 to +15	μamp
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_5g_1}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_5g_1}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet.	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*14000*	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*300*	*volts*
Grid-No.4-to Grid-No.1 Voltage for Focus with Ultor Current of 100 μamp	0 to 365	0 to 415	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	25 to 58	25 to 58	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak negative)	25 to 58	25 to 58	volts
Minimum Field Strength of PM Ion-Trap Magnet.	31	33	gausses

Maximum Circuit Values:

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

#,**,§: See next page.

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\# Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 12000 volts.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No. E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

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17AVP4/17ATP4
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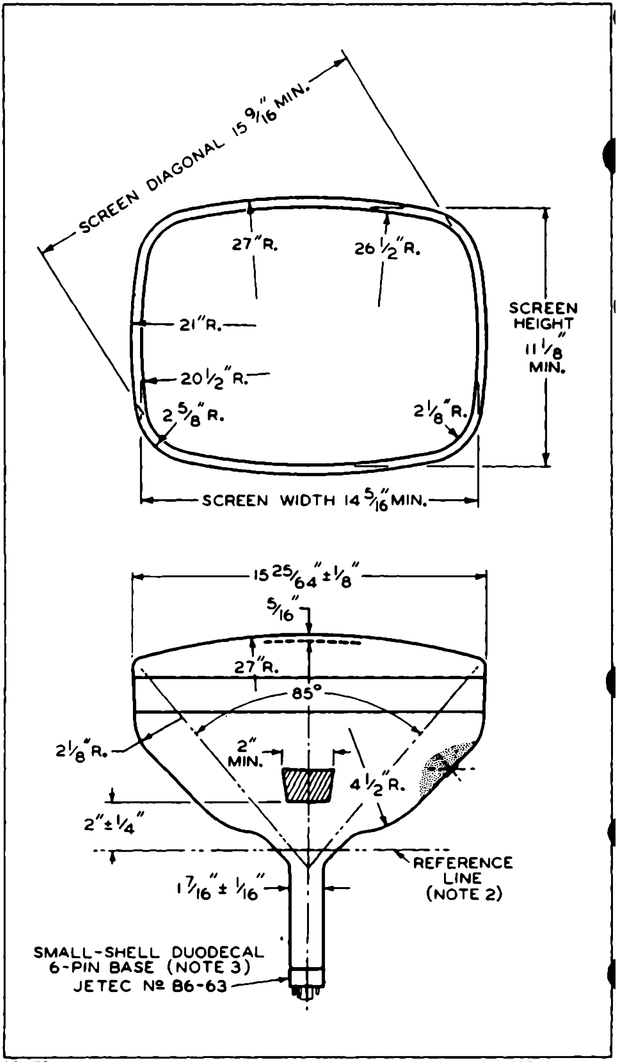

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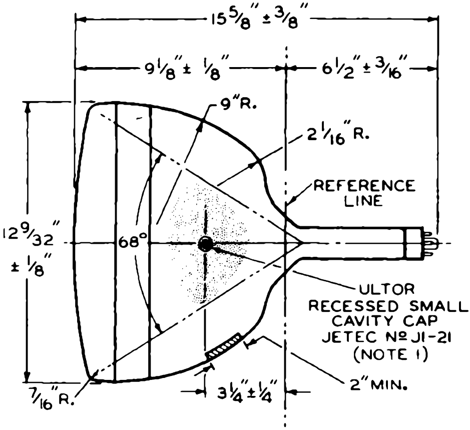
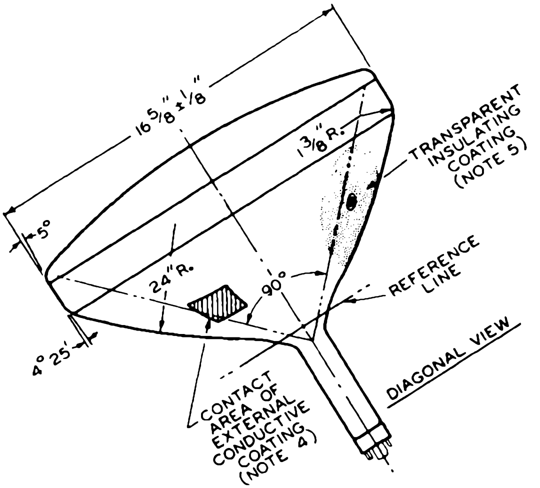
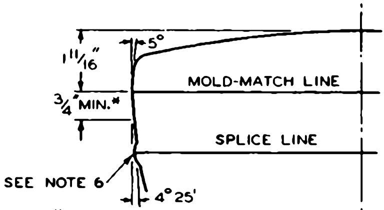
KINESCOPE





92CM-8341R1

17AVP4/17ATP4
KINESCOPE



*MAXIMUM WIDTH OF TUBE SUPPORT BAND.

DETAIL OF PANEL

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

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

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

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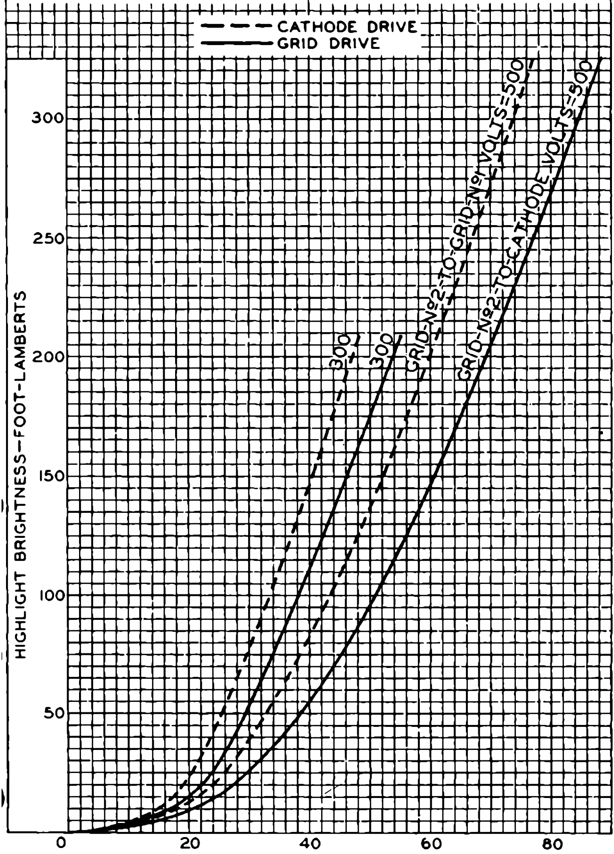
17AVP4 / 17ATP4

17AVP4

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 10 1/2"	RASTER SIZE 14" x 10 1/2"



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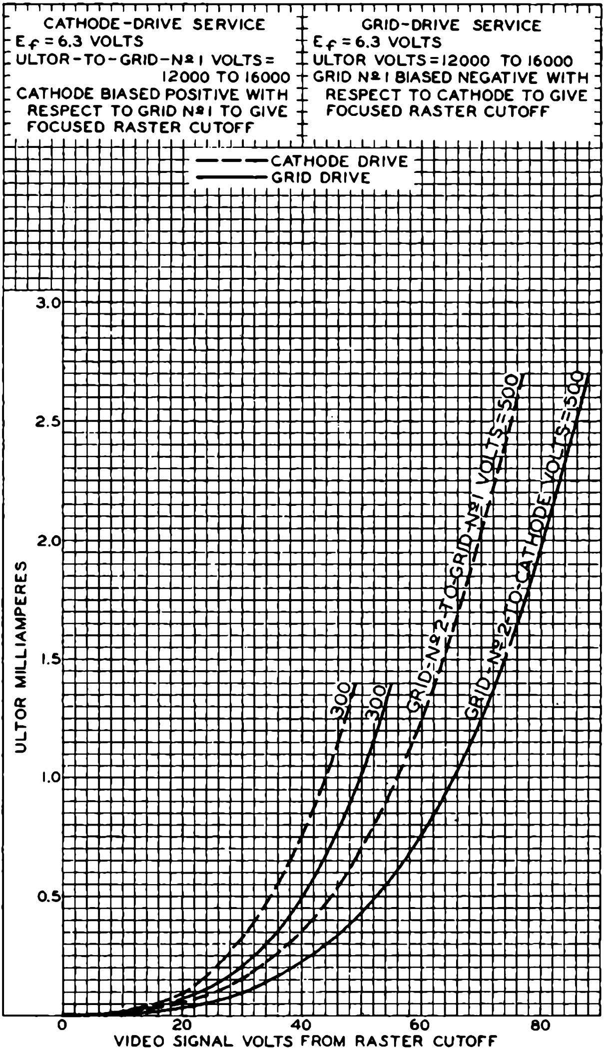
92CM-8746R1

17AVP4

17AVP4/17ATP4

AVERAGE DRIVE CHARACTERISTICS



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92CM-8618R1

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17AVP4-A/17ATP4-A
KINESCOPE

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

The 17AVP4-A/17ATP4-A is the same as the 17AVP4/17ATP4 except that it has an *aluminized phosphor* and greater light output as shown by the curves on the back of this sheet.

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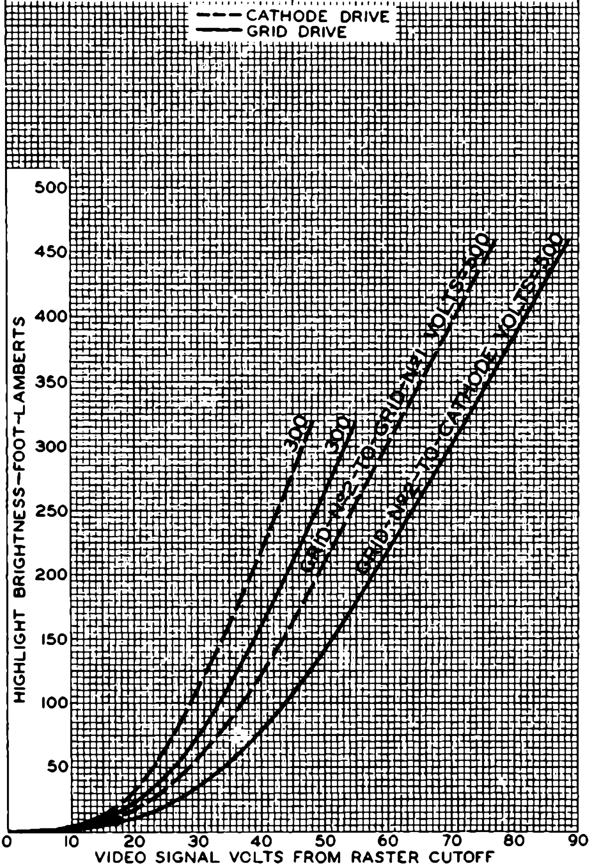
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

17AVP4-A/17ATP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f=6.3 VOLTS	E_f=6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS=16000	ULTOR VOLTS=16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF
RASTER FOCUSED AT AVERAGE BRIGHTNESS	RASTER FOCUSED AT AVERAGE BRIGHTNESS
RASTER SIZE=14" x 10½"	RASTER SIZE=14" x 10½"



17BP4-A

KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS MAGNETIC DEFLECTION

The 17BP4-A is the same as the 17BP4-B except that it utilizes a *non-aluminized phosphor* and has a light output as shown by the curves on the back of this sheet.

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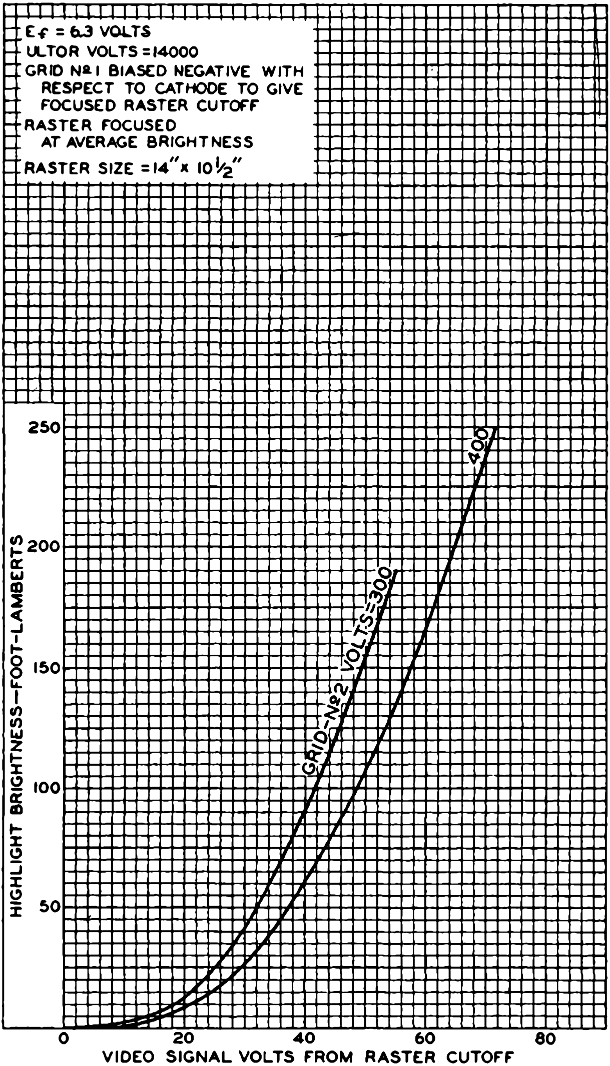
RCA

17BP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



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92CM-7595R2

RCA

17BP4-B

KINESCOPE

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

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. $\mu\mu f$ / 750 min. $\mu\mu f$

Faceplate, Spherical . . . . Filterglass
- Light transmission (Approx.) 66%

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

Focusing Method . . . . Magnetic
Deflection Method . . . . Magnetic

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

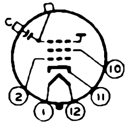
Ion-Trap Gun . . . . . . Requires External Single-Field Magnet

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"

Screen Dimensions (Minimum):
- Greatest width . . . . 14-1/4"
- Greatest height . . . . 10-3/4"
- Diagonal . . . . 15-1/4"
- Projected area . . . . 140 sq. in.

Weight (Approx.) . . . . 18 lbs
Mounting Position . . . . Any
Cap . . . . Recessed Small Cavity (JETEC No.J1-21)
Bulb J-133
Base . . . . . . Small-Shell Duodecal 5-Pin (JETEC 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

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17BP4-B

KINESCOPE

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

Equipment Design Ranges:

With any ultor voltage (E_{c_3}) between 12000 and 16000 volts and grid-No.2 voltage (E_{c_2}) between 150 and 410 volts*

Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of E_{c_2}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	9.3% to 24% of E_{c_2}	volts
Grid-No.2 Current	-15 to +15	µamp
Focusing-Coil Current (DC)°	$\left[\sqrt{\frac{E_{c_3}}{16000}} \times 106\right] \pm 10\%$	ma
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_3}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_3}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*12000*	*14000*	*volts*
and grid-No.2 voltage of	*300*	*300*	*volts*
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	28 to 72	28 to 72	volts
Focusing-Coil Current (DC)	92 ± 10%	99 ± 10%	ma
Minimum Field Strength of PM Ion-Trap Magnet	29	31	gausses

*,°,**,§: see next page.

17BP4-B
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 12000 volts.

o For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line *(See Dimensional Outline)*. The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 14-1/4" x 10-3/4" picture size.

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

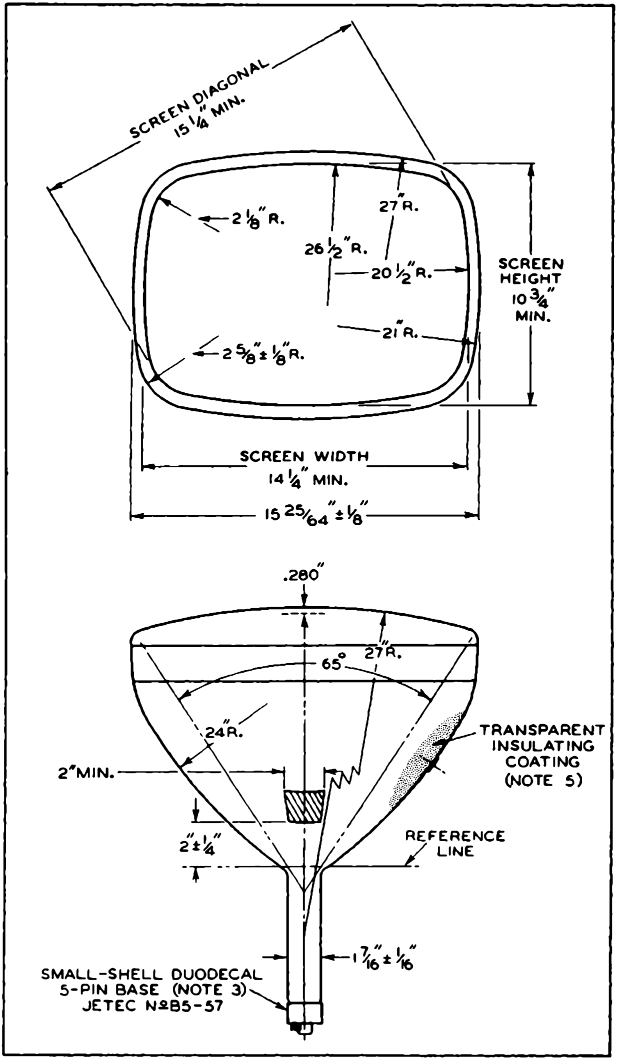
§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

17BP4-B

RCA

17BP4-B
KINESCOPE



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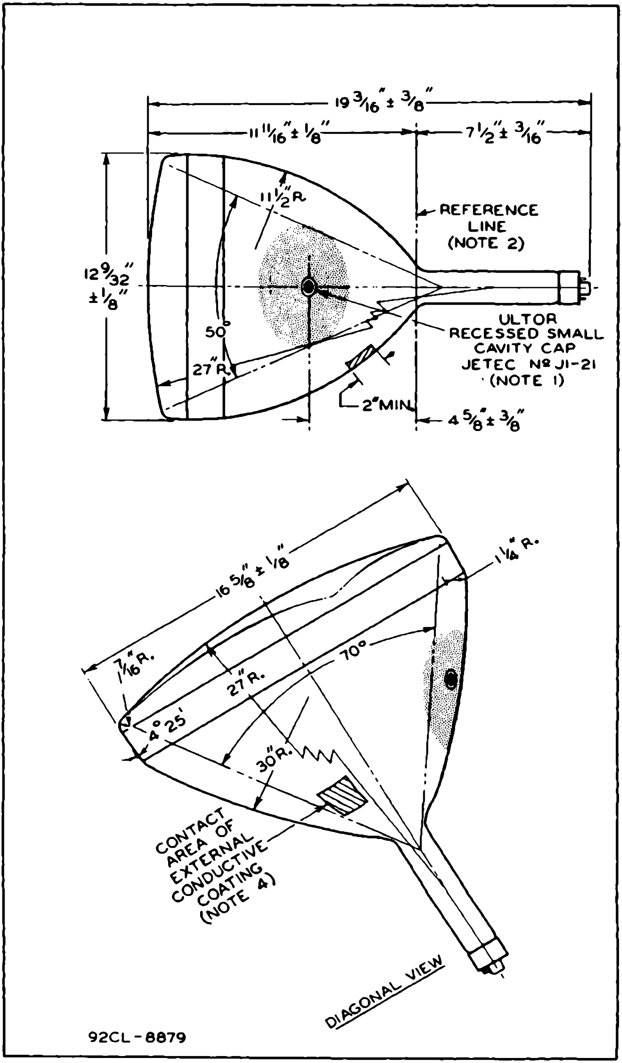
17BP4-B

KINESCOPE



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17BP4-B

KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.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 VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE 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.

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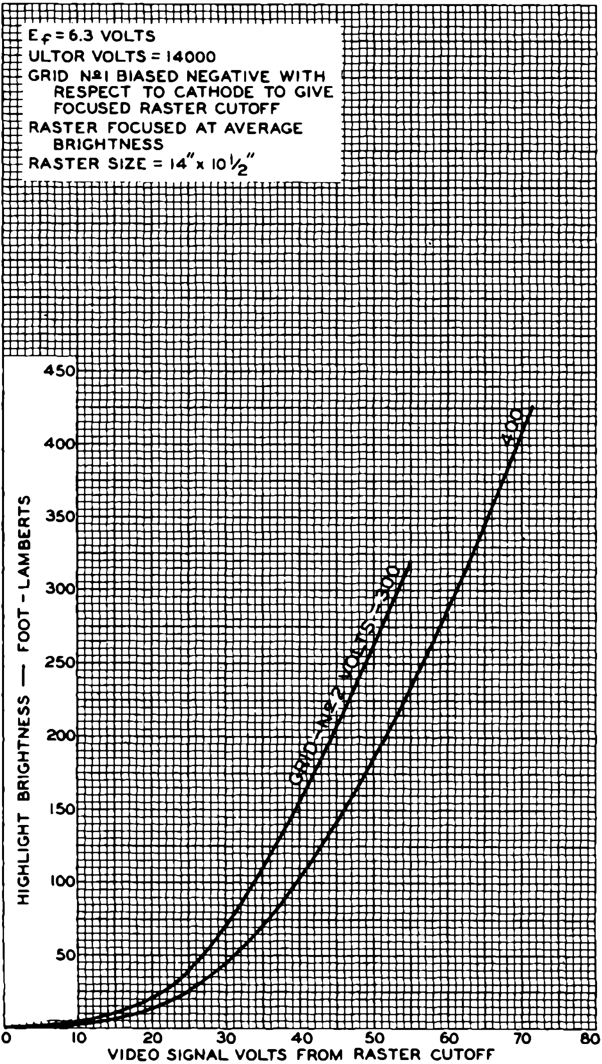
RCA

17BP4-B

AVERAGE GRID-DRIVE CHARACTERISTICS



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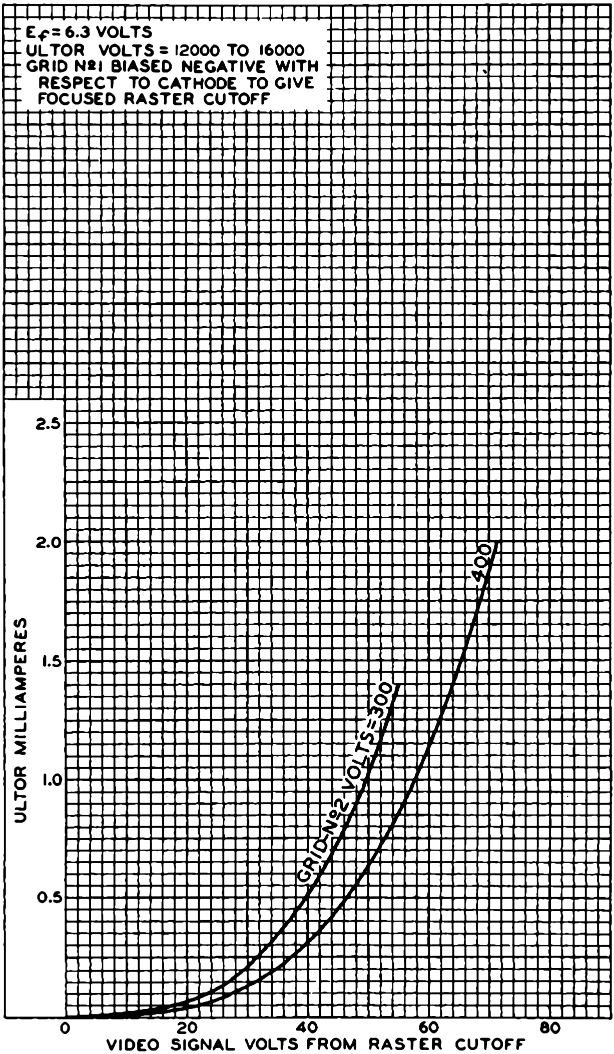
92CM-8861

17BP4-B

AVERAGE GRID-DRIVE CHARACTERISTICS



17CP4

17CP4

KINESCOPE

RECTANGULAR METAL-SHELL TYPE

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	$\mu\mu f$
Cathode to All Other Electrodes	5	$\mu\mu f$

Face Plate (Transmission of about 65%)	Frosted Filterglass
Phosphor (For Curves, see front of this Section)	No.4-Sulfide Type
Fluorescence and Phosphorescence	White
Persistence of Phosphorescence	Short
Focusing Method	Magnetic
Deflection Method	Magnetic

Deflection Angles (Approx.):

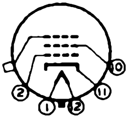
Diagonal	70°
Horizontal	66°
Vertical	50°
Ion-Trap Gun	Requires External, Single-Field Magnet
Maximum Overall Length	19"
Greatest Diagonal of Tube at Lip	16-13/16" ± 3/16"
Greatest Width of Tube at Lip	15-15/16" ± 1/8"
Greatest Height of Tube at Lip	12-1/4" ± 1/8"
Screen Size	14-5/8" x 11"
Mounting Position	Any
Anode Terminal	Metal-Shell Lip
Base	Small-Shell Duodecal 5-Pin (JETEC No.B5-57)
Basing Designation for BOTTOM VIEW	$12D_1$

Pin 1 - Heater

Pin 2 - Grid No.1

Pin 10 - Grid No.2

Pin 11 - Cathode



Pin 12 - Heater

Metal-Shell Lip: Anode

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

ANODE VOLTAGE[o]	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	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

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

RCA

17CP4

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Typical Operation:

Anode Voltage*	12000	14000	volts
Grid-No.2 Voltage	300	300	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-33 to -77	-33 to -77	volts
Focusing Coil Current (DC)▲	96 ± 6%	104 ± 6%	ma
Field Strength of Single-Field Ion-Trap Magnet§	45	50	gausses
Ion-Trap Magnet Current (DC, approx.)#	70	-	ma

Maximum Circuit Values:

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

Minimum Circuit Values:

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

Grid-No.1-Circuit Resistance	150 min.	ohms
Grid-No.2-Circuit Resistance	470 min.	ohms
Anode-Circuit Resistance	18000 min.	ohms

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

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 12000 volts.

▲ For specimen focusing coil similiar to JETEC Focusing Coil No.109, positioned with air gap toward kinescope screen, and center line of air gap about 3 inches from Reference Line (see Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 14-3/8" x 10-11/16" picture area sharply focused at center of screen.

§ Measured at center of field with General Electric Gauss Meter, Cat. No. 409X51.

\# For specimen ion-trap magnet similiar to JETEC Ion-Trap Magnet No.111, located in optimum position and rotated to give maximum brightness.

OPERATING NOTES

When operated at anode voltages up to 16 kilovolts, the 17CP4 does not produce any harmful x-ray radiation. However, because the rating of the tube permits operation at anode voltages as high as 17.6 kilovolts (absolute value), shielding of the 17CP4 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.

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17CP4

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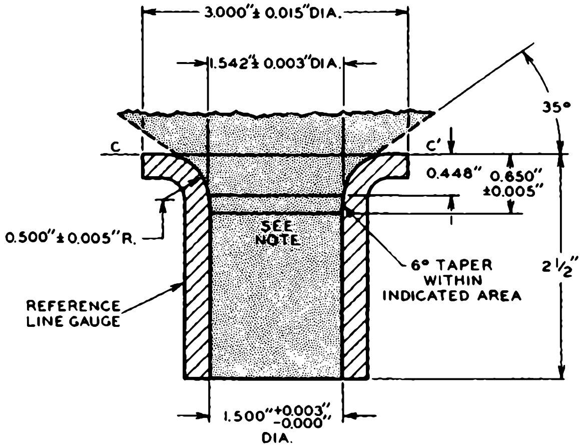
REFERENCE-LINE GAUGE

Reference-Line Gauge (JETEC No. 110) with Supplementary Information on Recommended Inside Contour of Yoke to Provide Proper Location of Yoke on Neck-Funnel Section



NOTE: INNER SURFACE OF YOKE MUST NOT EXTEND INTO SHADED REGION

92CS-7391

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17CP4

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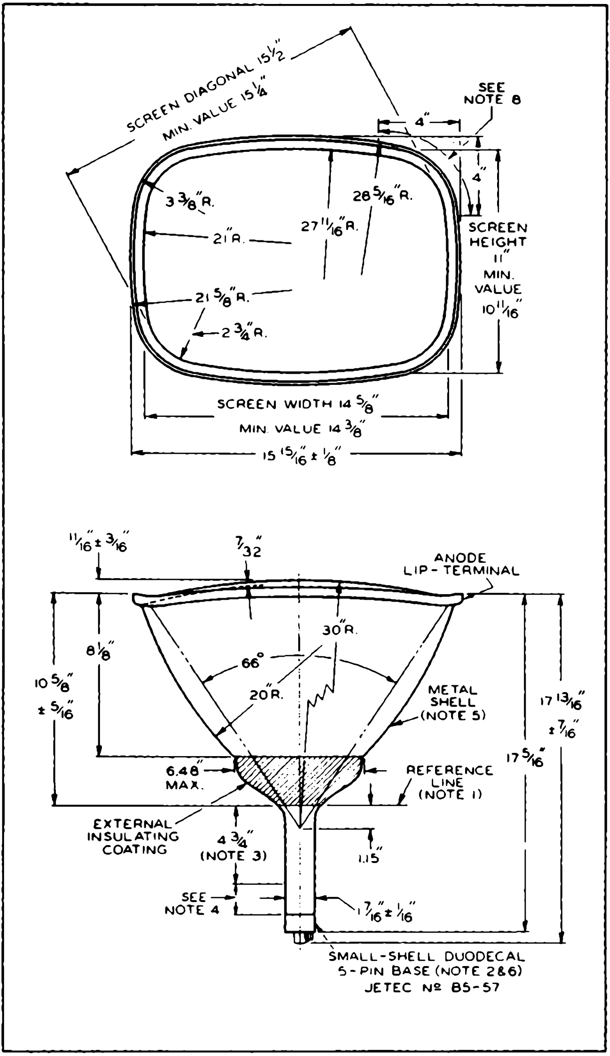

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17CP4

17CP4

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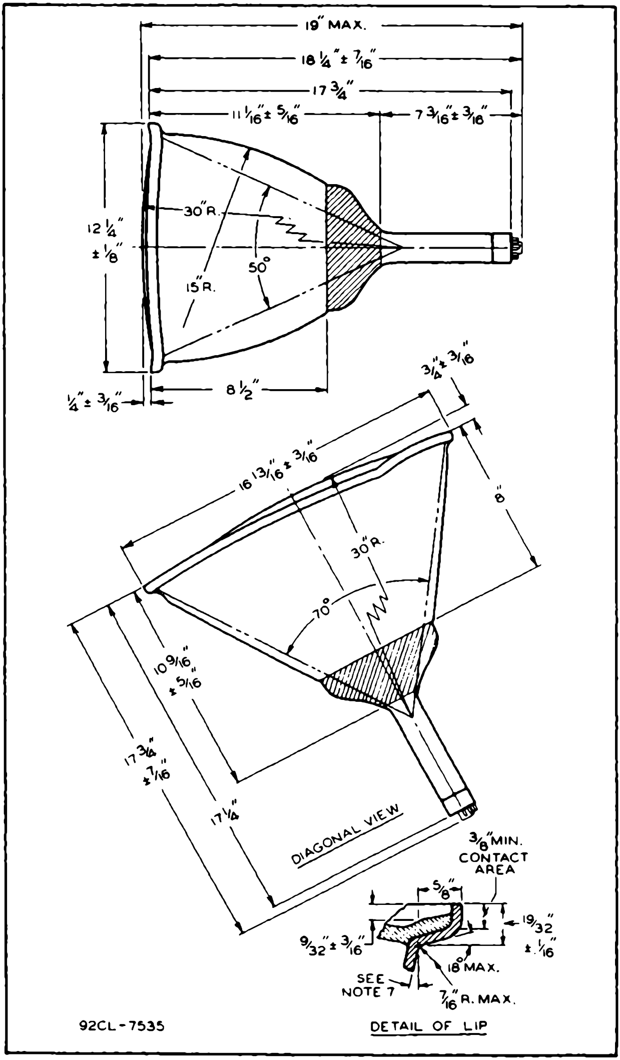

JAN. 1, 1951

17CP4

17CP4
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NOTE 1: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE (JETEC No. 110) 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 2-3/4".

NOTE 3: LOCATION OF DEFLECTING YOKE AND FOCUSING DEVICE MUST BE WITHIN THIS SPACE.

NOTE 4: KEEP THIS SPACE CLEAR FOR SINGLE-FIELD, ION-TRAP MAGNET. DIRECTION OF THE FIELD OF THE ION-TRAP MAGNET SHOULD BE SUCH THAT THE NORTH POLE IS ADJACENT TO VACANT PIN POSITION No.8 AND THE SOUTH POLE TO PIN No.2.

NOTE 5: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST HAVE INSULATING PROPERTIES ADEQUATE TO WITHSTAND THE APPLIED ANODE VOLTAGE PLUS 10%.

NOTE 6: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE MAJOR AXIS OF THE GLASS FACE BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10°.

NOTE 7: IN THIS REGION THE ANGULAR VARIATION AROUND PERIPHERY OF SHELL IS 0° TO 18°.

NOTE 8: SUPPORT TUBE BY LIP ONLY AT CORNERS WITHIN THIS SPACE.

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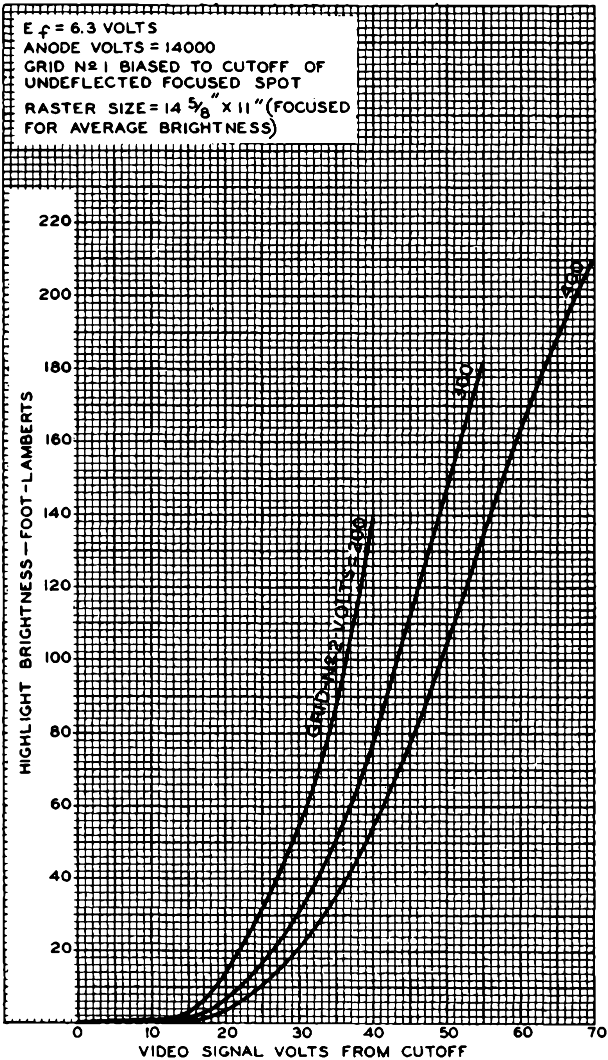
17CP4

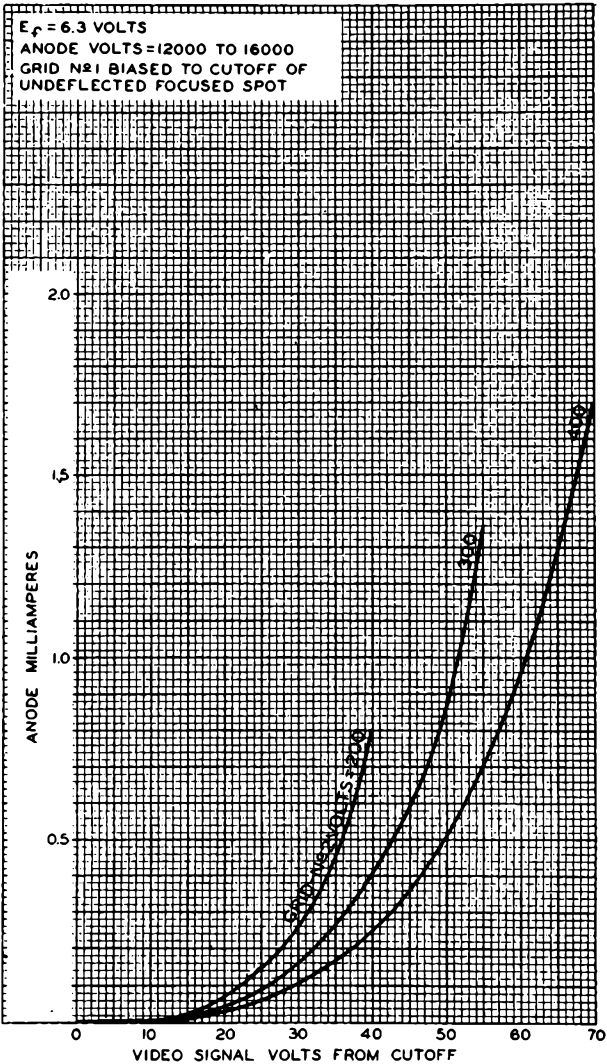
AVERAGE GRID-DRIVE CHARACTERISTICS



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17CP4

AVERAGE GRID-DRIVE CHARACTERISTICS



OCT. 3, 1950

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92CM-7548

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17GP4

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RECTANGULAR METAL-SHELL TYPE

ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6	amp

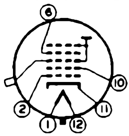
Direct Interelectrode Capacitances:

Grid No.1 to All Other Electrodes	6	$\mu\mu$f
Cathode to All Other Electrodes	5	$\mu\mu$f

Face Plate (With about 66% light transmission)	Frosted Filterglass
Phosphor	No.4-Sulfide Type
Fluorescence and Phosphorescence	White
Persistence of Phosphorescence	Short
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	70°
Horizontal	66°
Vertical	50°
Ion-Trap Gun	Requires External, Single-Field Magnet
Maximum Overall Length	19-5/16"
Greatest Diagonal of Tube at Lip	16-13/16" ± 3/16"
Greatest Width of Tube at Lip	15-15/16" ± 1/8"
Greatest Height of Tube at Lip	12-1/4" ± 1/8"
Screen Size	14-5/8" x 11"
Mounting Position	Any
Ultor● Terminal	Metal-Shell Lip
Base	Small-Shell Duodecal 6-Pin (JETEC No.B6-63)

BOTTOM VIEW

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



Pin 12 - Heater
Metal-Shell Lip - Grid No.3, Grid No.5, Collector

Maximum Ratings, *Design-Center Values*:

ULTOR● VOLTAGE	16000 max.	volts
GRID-No.4 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
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

●: See next page.

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17GP4

17GP4
KINESCOPE

Equipment Design Ranges:

For any ultor voltage (E_u) between 12000 and 16000 volts and grid-No.2 voltage (Ec_2) between 150 and 500 volts*

Grid-No.4 Voltage for Ultor Current of 100 μamp.	19.1% to 25.9% 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.4 Current.	-15 to +25	μamp
Grid-No.2 Current.	-15 to +15	μamp
Field Strength of Single-Field Ion-Trap Magnet (Approx.). . .	$\sqrt{\frac{E_u}{12000}} \times 35$	gausses
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.	*300*	*300*	*volts*
Grid-No.4 Voltage for Ultor Current of 100 μamp	2290 to 3100	2670 to 3620	volts
Grid-No.1 Voltage†	-33 to -77	-33 to -77	volts
Ion-Trap Magnet (Rated Strength)	35	40	gausses

Maximum Circuit Values:

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

● In the 17GP4, grid No.5 which has the ultor function, grid No.3, 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.

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.

† For visual extinction of undeflected focused spot.

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17GP4

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OPERATING NOTES

X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, the 17GP4 does not produce any harmful x-ray radiation. However, because the rating of the tube permits operation at voltages as high as 17.6 kilovolts (absolute value), shielding of the 17GP4 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.

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

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17GP4
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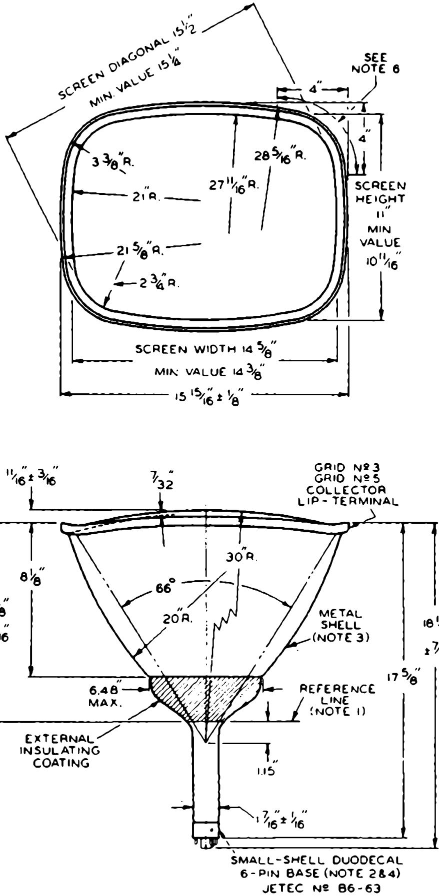

MAY 1, 1951

CE-7601A

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17GP4

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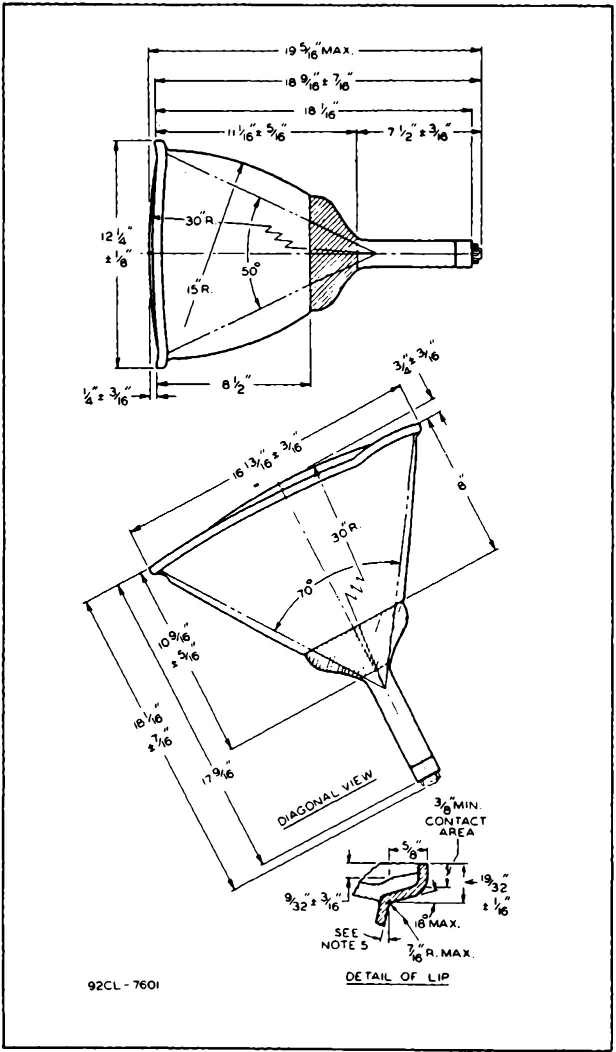

MAY 1, 1951

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7601B

17GP4

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NOTE 1: 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 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 2-3/4".

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.

NOTE 4: THE PLANE THROUGH THE TUBE AXIS AND PIN No. 6 MAY VARY FROM THE HORIZONTAL AXIS OF THE GLASS FACE BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^{\circ}$.

NOTE 5: IN THIS REGION THE ANGULAR VARIATION AROUND PERIPHERY OF METAL SHELL IS 0° TO 18°.

NOTE 6: SUPPORT TUBE BY LIP ONLY AT CORNERS WITHIN THIS SPACE.

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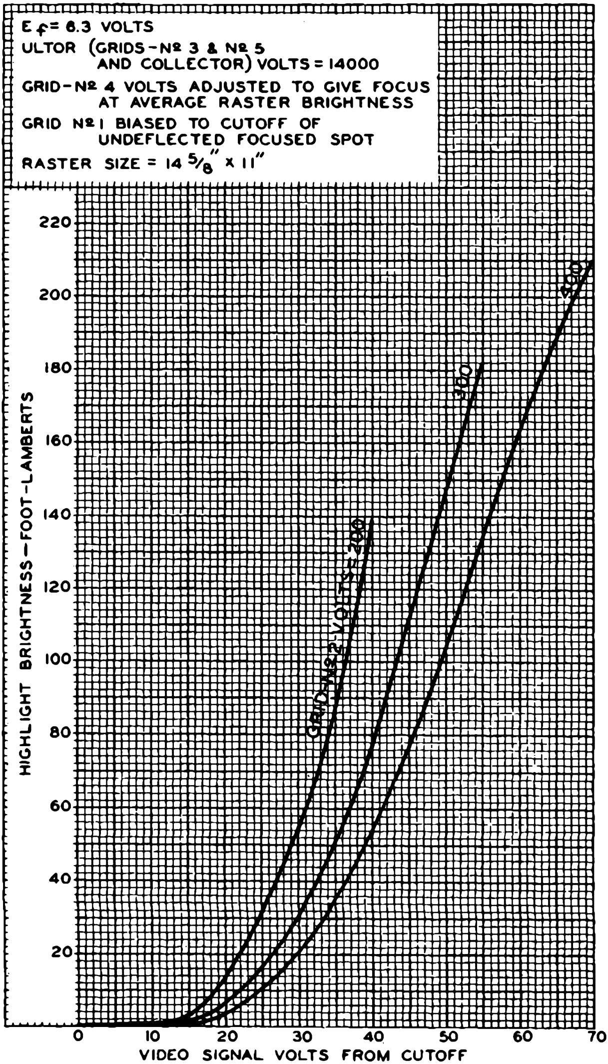
17GP4

AVERAGE GRID-DRIVE CHARACTERISTICS



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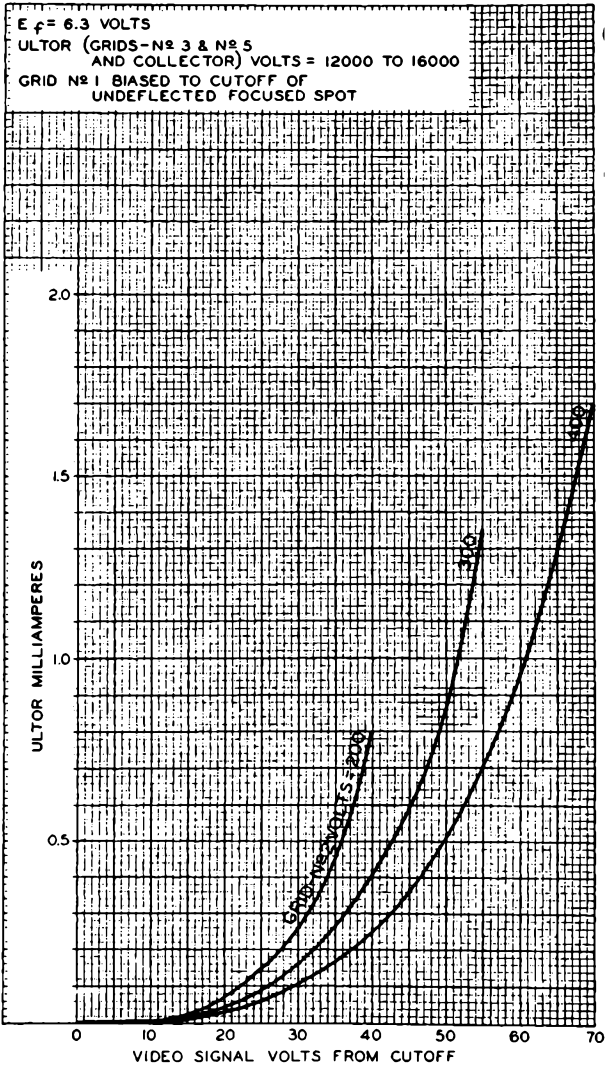
17GP4

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 8, 1951

TUBE DEPARTMENT
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92CM-7607

17HP4 / 17RP4

KINESCOPE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS MAGNETIC DEFLECTION

The 17HP4/17RP4 is the same as the 17HP4-B except that it utilizes a *non-aluminized phosphor* and has a light output as shown by the curves on the back of this sheet.

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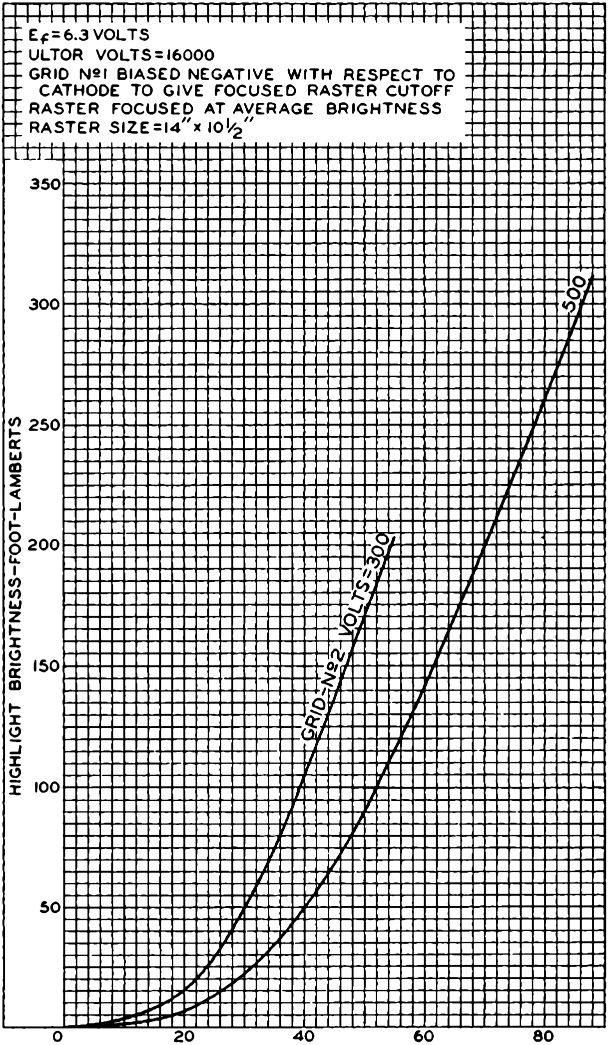
17HP4

17HP4

AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

17HP4-B

KINESCOPE

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

DATA

General:

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

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . . . 6 μμf
- Cathode to all other electrodes . . . . . . 5 μμf
- External conductive coating to ultor . . . {1500 max. μμf / 750 min. μμf}

Faceplate, Spherical . . . . Filterglass
- Light transmission (Approx.) 66%

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 . . . . 70°
- Horizontal . . . . 65°
- Vertical . . . . 50°

Ion-Trap Gun . . . . . . Requires 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"

Screen Dimensions (Minimum):
- Greatest width . . . . 14-1/4"
- Greatest height . . . . 10-3/4"
- Diagonal . . . . 15-1/4"
- Projected area . . . . 140 sq. in.

Weight (Approx.) . . . . 18 lbs

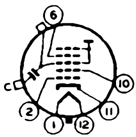
Mounting Position . . . . Any

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

Bulb J-133

Base . . . . . . Small-Shell Duodecal 6-Pin (JETEC No.B6-63)
- Basing Designation for BOTTOM VIEW 12L

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



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

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17HP4-B

KINESCOPE

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 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
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 150 and 500 volts

Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp	-0.4% to +2.2% of Ec_5k	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of Ec_2k	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak positive)	9.3% to 24% of Ec_2k	volts
Grid-No.4 Current	-25 to +25	μamp
Grid-No.2 Current	-15 to +15	μamp
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{Ec_5k}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{Ec_5k}{16000}} \times 33$	gausses
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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17HP4-B

KINESCOPE

Examples of Use of Design Ranges:

With ultor voltage of	*14000*	*16000*	*volts*
and grid-No.2 voltage of	*300*	*300*	*volts*
Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp . . .	−55 to +300	−65 to +350	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster.	−28 to −72	−28 to −72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	28 to 72	28 to 72	volts
Minimum Field Strength of PM Ion-Trap Magnet. . . .	31	33	gausses

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	16000 max.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 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

■ 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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17HP4-B

KINESCOPE

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 165 and 620 volts

Grid-No.4-to-Grid-No.1 Voltage for Focus with Ultor Current of 100 µamp.	0% to 2.6% of Ec_5g_1	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster.	8.5% to 19.4% of Ec_2g_1	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	8.5% to 19.4% of Ec_2g_1	volts
Grid-No.4 Current.	-25 to +25	µamp
Grid-No.2 Current.	-15 to +15	µamp
Ion-Trap Magnet Current (Average)**.	$\sqrt{\frac{Ec_5g_1}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet §	$\sqrt{\frac{Ec_5g_1}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet.	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*14000*	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*300*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for Focus with Ultor Current of 100 µamp	0 to 365	0 to 415	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	25 to 58	25 to 58	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	25 to 58	25 to 58	volts
Minimum Field Strength of PM Ion-Trap Magnet.	31	33	gausses

Maximum Circuit Values:

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

#,**,§: See next page.

17HP4-B
KINESCOPE

\# Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-to-grid-No.1 voltage should not be less than 12000 volts.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

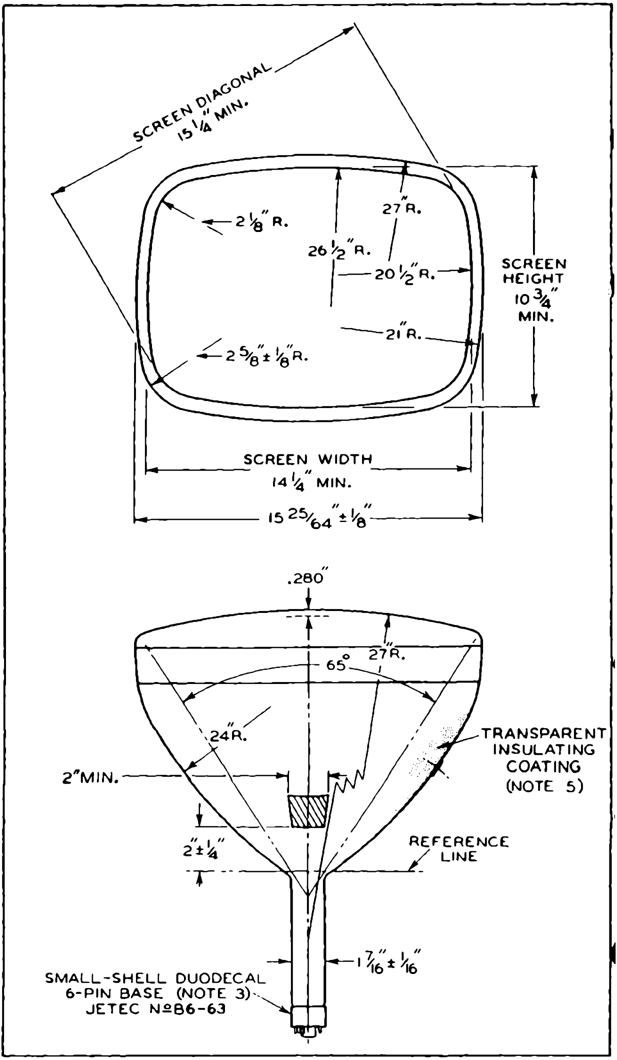
For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

17HP4-B

KINESCOPE



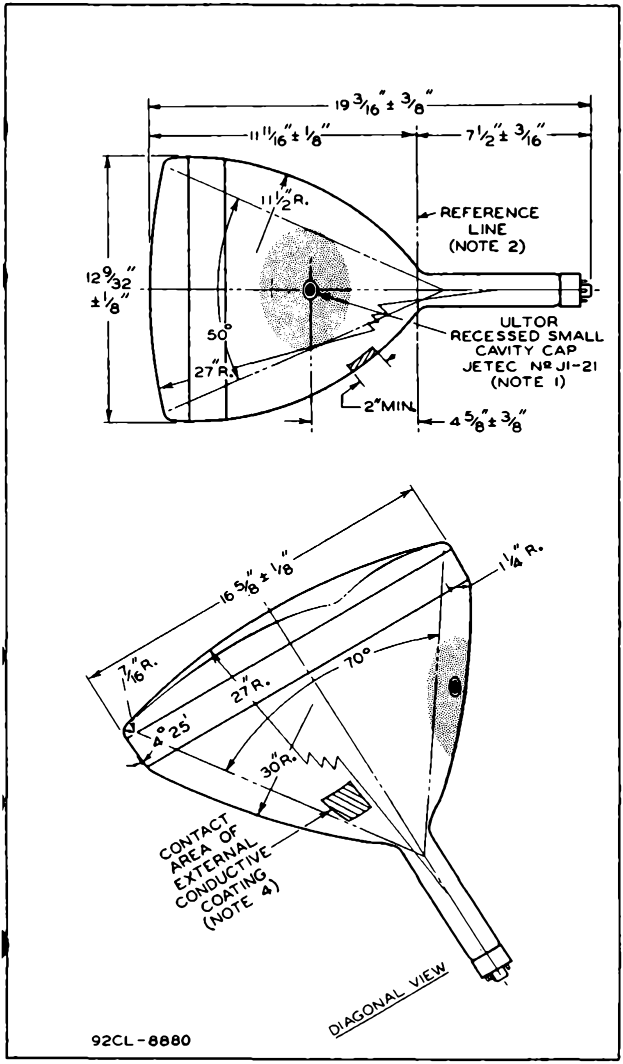
2-56

CE-8880A

RCA

17HP4-B

KINESCOPE



TUBE DIVISION
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17HP4-B

KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.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 No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE 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.

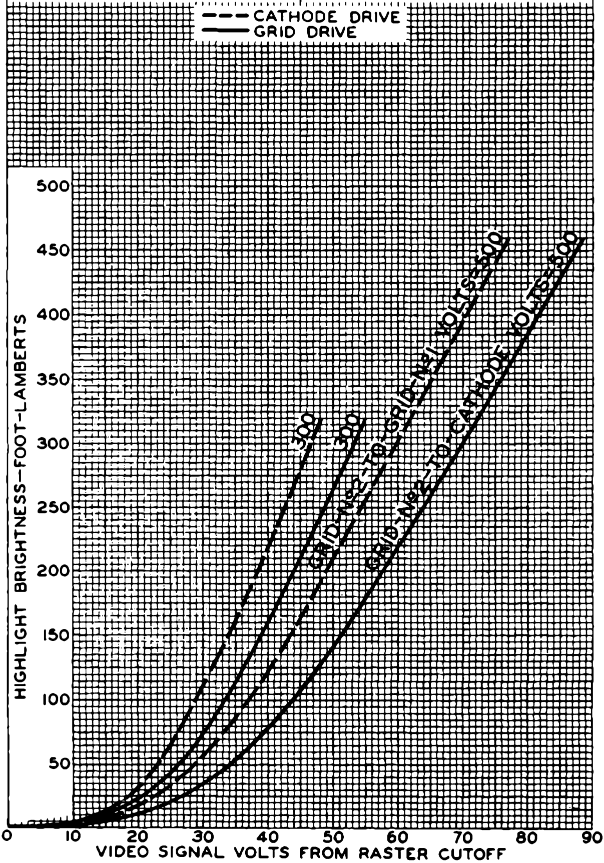
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

17HP4-B

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"



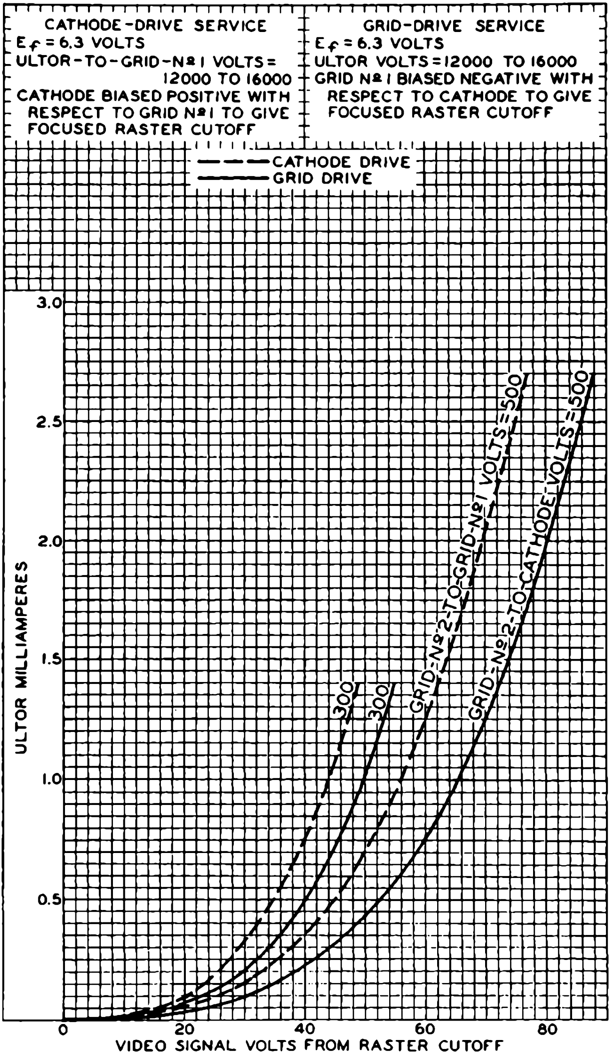
TUBE DIVISION

92CL-8862

17HP4-B

17HP4-B

AVERAGE DRIVE CHARACTERISTICS



92CM-8915

RCA 17JP4 KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

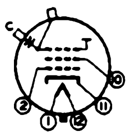
DATA

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	6	μμf
Cathode to All Other Electrodes	5	μμf
External Conductive Coating to Ultor●	750 max.	μμf
	500 min.	μμf
Faceplate, Spherical		Filterglass
Light Transmission (Approx.)		66%
Phosphor (For Curves, see front of this Section).		P4—Sulfide Type
Fluorescence and Phosphorescence		White
Persistence of Phosphorescence		Short
Focusing Method		Magnetic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		70°
Horizontal		65°
Vertical		50°
Ion-Trap Gun		Requires External, Single-Field Magnet
Tube Dimensions:		
Overall Length		19-3/16" ± 3/8"
Greatest Diagonal		16-5/8" ± 1/8"
Greatest Width		15-3/8" ± 1/8"
Greatest Height		12-9/32" + 1/8" -7/32"
Minimum Screen Dimensions:		
Greatest Width		14-1/4"
Greatest Height		10-3/4"
Diagonal		15-1/4"
Weight (Approx.)		18 lbs
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 - Ultor (Grid No.3, Collector)
C - External Conductive Coating

Maximum Ratings, *Design-Center Values*:

ULTOR● VOLTAGE	18000 max.	volts

● In the 17JP4, 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.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17JP4

17JP4

KINESCOPE

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

Equipment Design Ranges:

For any ultor voltage (E_u) between 12000# and 18000 volts and grid-No.2 voltage (E_{c2}) between 150 and 410 volts.

Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	11% to 25.7% of E_{c2}	volts
Grid-No.2 Current	-15 to +15	μamp
Focusing-Coil Current (DC)∞. .	$\left[\sqrt{\frac{E_u}{12000}} \times 96\right] \pm 10\%$	ma
Field Strength of Single-Field Ion-Trap Magnet (Approx.)** .	$\sqrt{\frac{E_u}{12000}} \times 42$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

For ultor voltage of	*14000*	*16000*	*volts*
and grid-No.2 voltage of	*300*	*300*	*volts*
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot.	-33 to -77	-33 to -77	volts
Focusing-Coil Current (DC). .	104 ± 10%	110 ± 10%	ma
Ion-Trap Magnet (Rated Strength).	45	50	gausses

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 12000 volts.

∞ For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen, and center line of air gap 3 inches from Reference Line (see *Outline Drawing*). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 14-1/4" x 10-3/4" picture area sharply focused at center of screen.

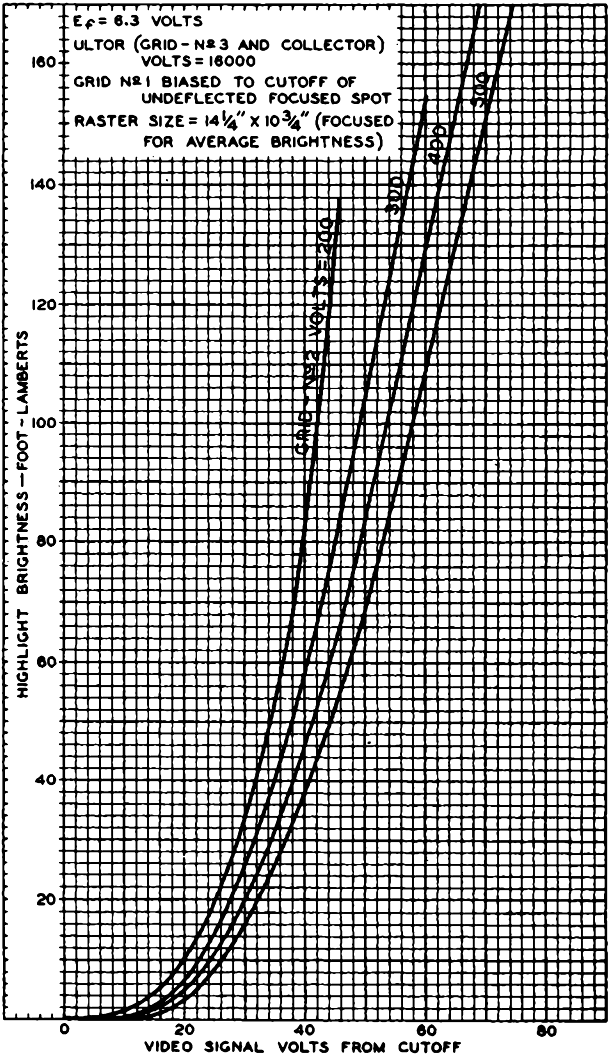
** With a specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No. 111 located in optimum position and rotated to give maximum brightness, the ion-trap magnet current is 82 milliamperes dc when the ultor voltage is 14000 volts and grid-No.2 voltage is 300 volts.

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

RCA

17JP4

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 13, 1952

TUBE DEPARTMENT
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92CM-7753

17JP4

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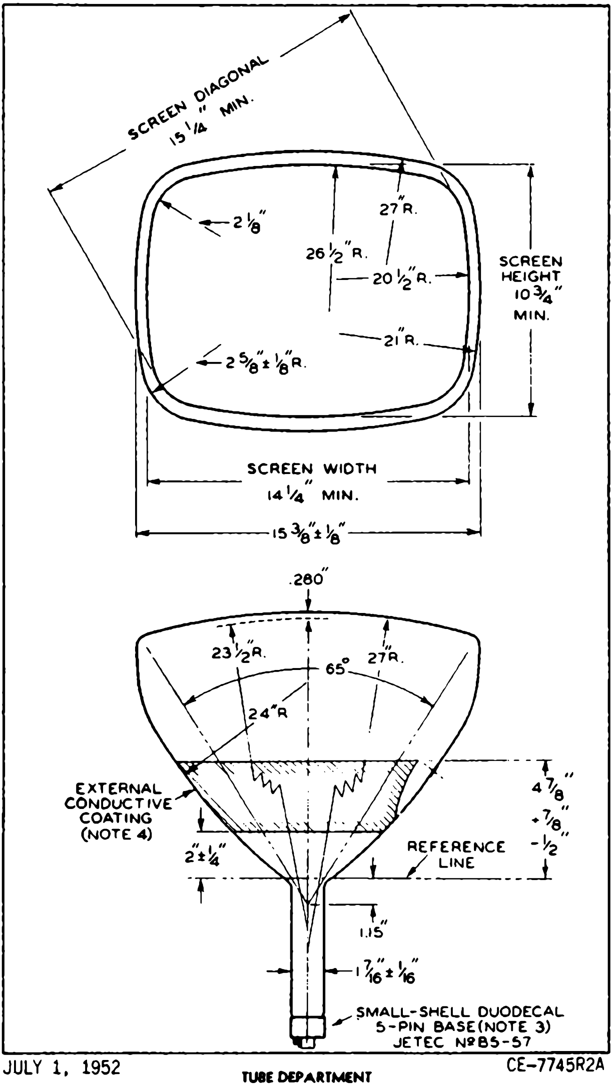

JULY 1, 1952 CE-7745R2A

TUBE DEPARTMENT
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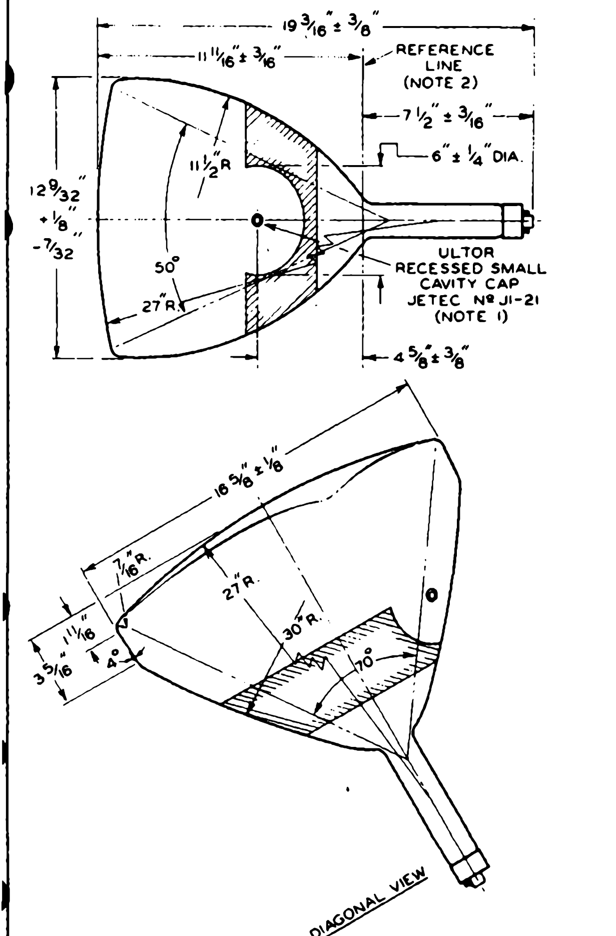
RCA

17JP4

KINESCOPE



92CL-7745R2

17JP4

17JP4

KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.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 VACANT PIN POSITION No.6.

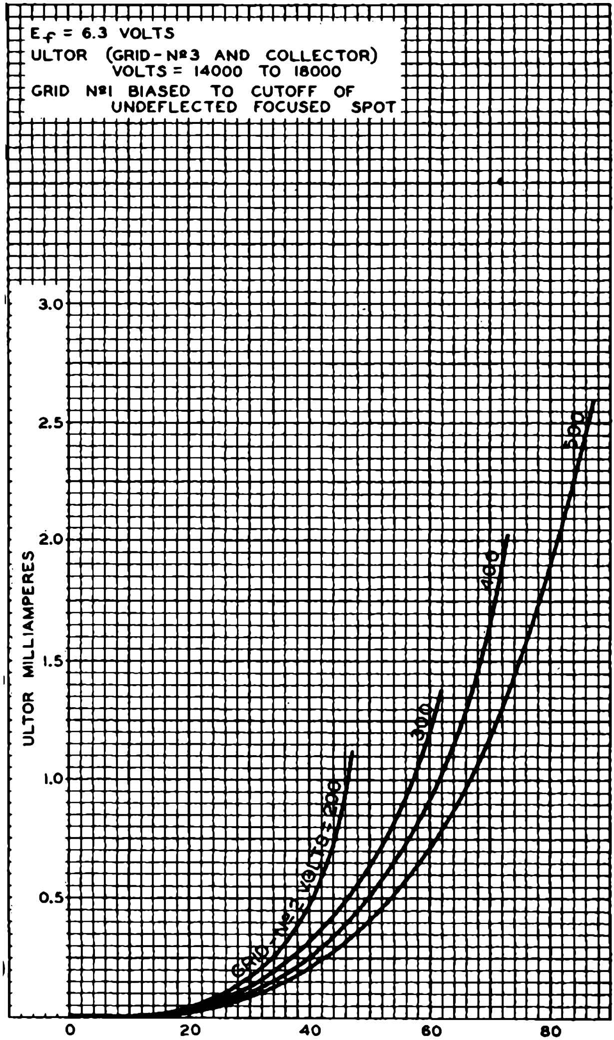
NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

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.

17JP4

AVERAGE GRID-DRIVE CHARACTERISTICS



NOV. 14, 1951

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7652R1

17LP4/17VP4

KINESCOPE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

The 17LP4/17VP4 is the same as the 17LP4-A except that it utilizes a *non-aluminized phosphor* and has a light output as shown by the curves on the back of this sheet.

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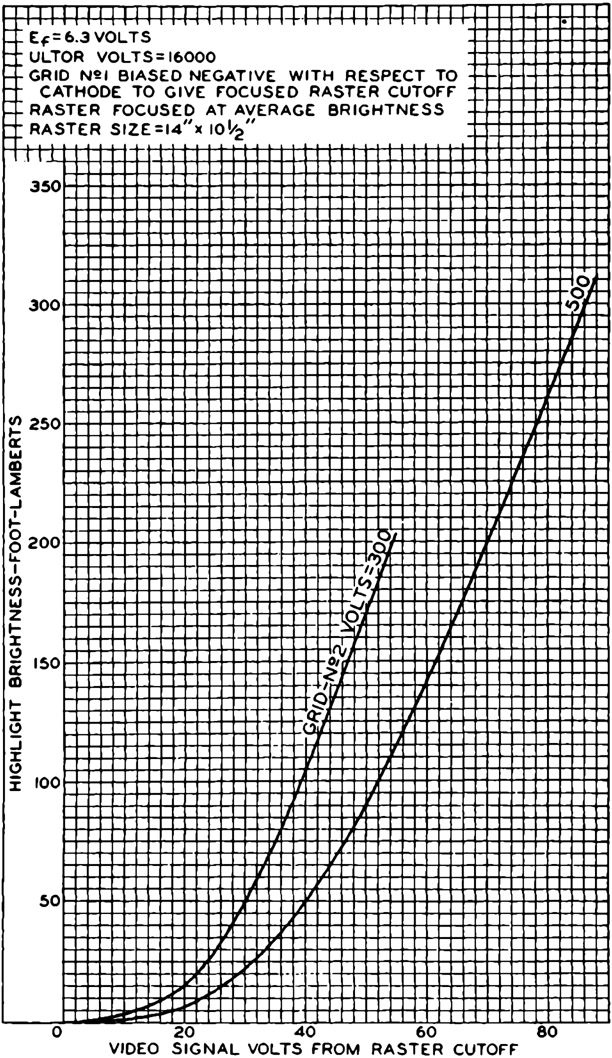
17LP4

17LP4

AVERAGE GRID-DRIVE CHARACTERISTICS



17LP4-A

KINESCOPE

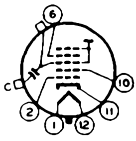
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	1500 max.	μμf
	750 min.	μμf
Faceplate, Cylindrical		Filterglass
Light transmission (Approx.)		72%
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		70°
Horizontal		65°
Vertical		50°
Ion-Trap Gun		Requires 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"
Screen Dimensions (Minimum):		
Greatest width		14-1/4"
Greatest height		10-3/4"
Diagonal		15-5/16"
Projected area		140 sq. in.
Weight (Approx.)		19 lbs
Mounting Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Bulb		J-133
Base		Small-Shell Duodecal 6-Pin (JETEC No.B6-63)
Basing Designation for BOTTOM VIEW		12L

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



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

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17LP4-A

17LP4-A
KINESCOPE

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE:	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value.	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

Equipment Design Ranges:

With any ultor voltage (Ec_5) between 12000# and 16000 volts and grid-No.2 voltage (Ec_2) between 150 and 500 volts

Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp.	-0.4% to +2.2% of Ec_5	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of Ec_2	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-Level value (Peak positive)	9.3% to 24% of Ec_2	volts
Grid-No.4 Current.	-25 to +25	μamp
Grid-No.2 Current.	-15 to +15	μamp
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{Ec_5}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§.	$\sqrt{\frac{Ec_5}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

\# Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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17LP4-A
KINESCOPE

Examples of Use of Design Ranges:

With ultor voltage of	*14000*	*16000*	*volts*
and grid-No.2 voltage of	*300*	*300*	*volts*
Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp. . . .	-55 to +300	-65 to +350	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	28 to 72	volts
Minimum Field Strength of PM Ion-Trap Magnet	31	33	gausses

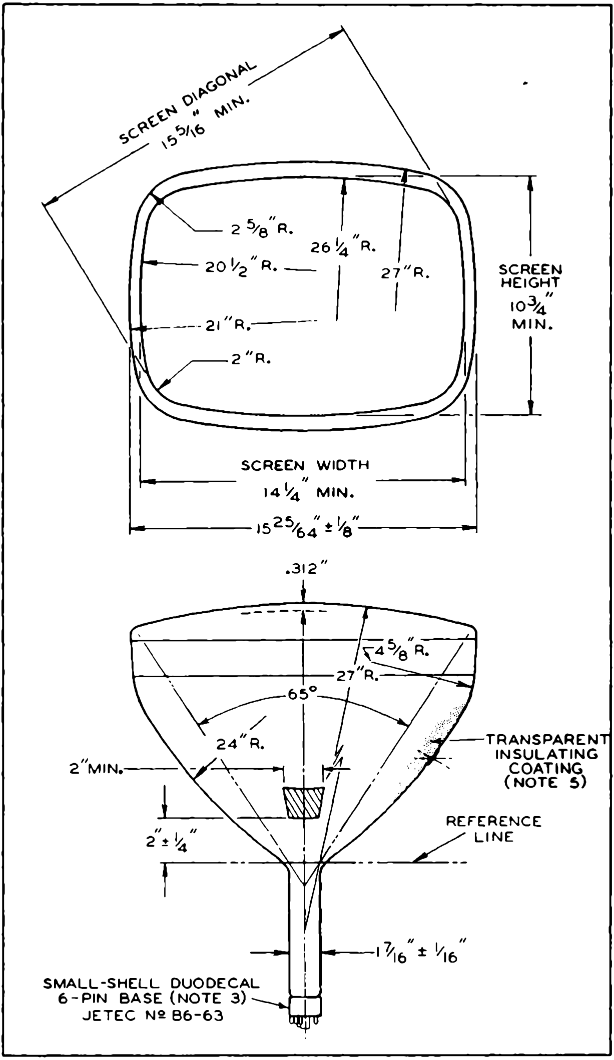
Maximum Circuit Values:

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

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

17LP4-A

KINESCOPE



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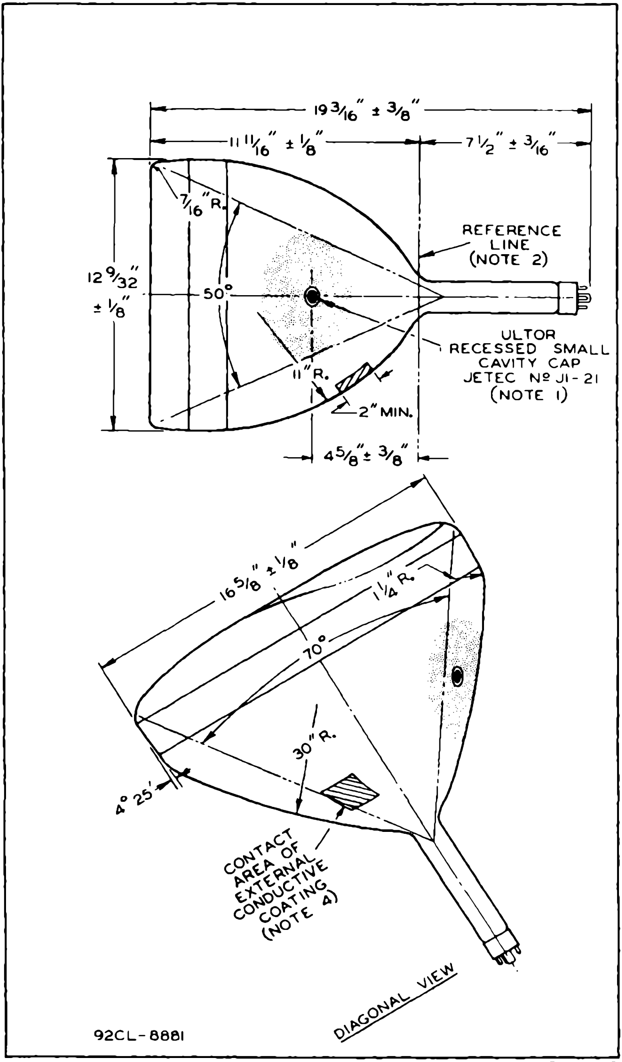
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17LP4-A

KINESCOPE



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17LP4-A
KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^{\circ}$. ULTOR TERMINAL IS ON SAME SIDE AS PIN No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE 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.

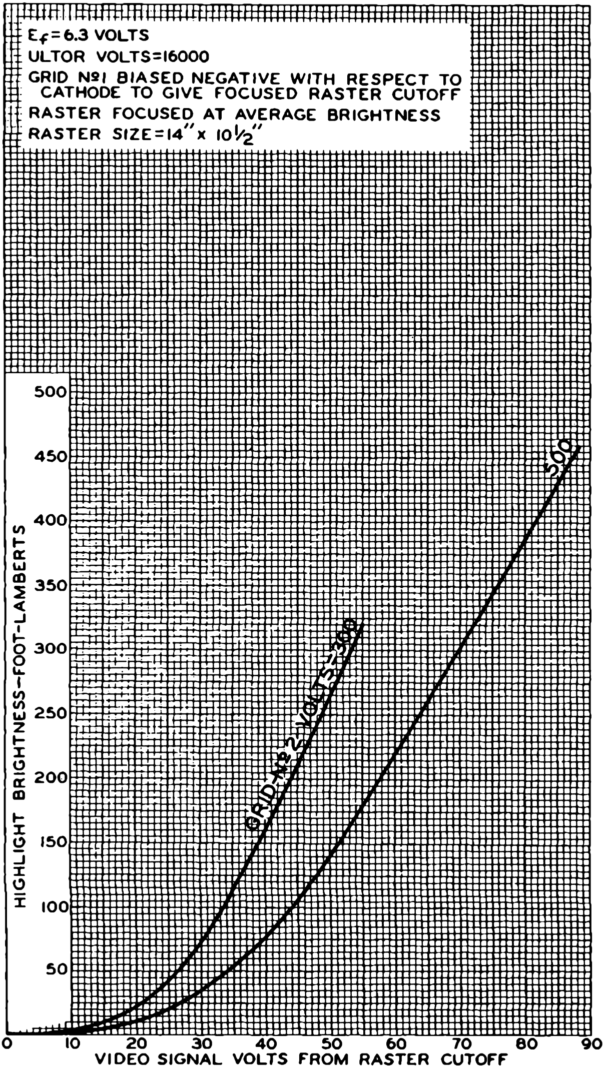
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

17LP4-A

17LP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



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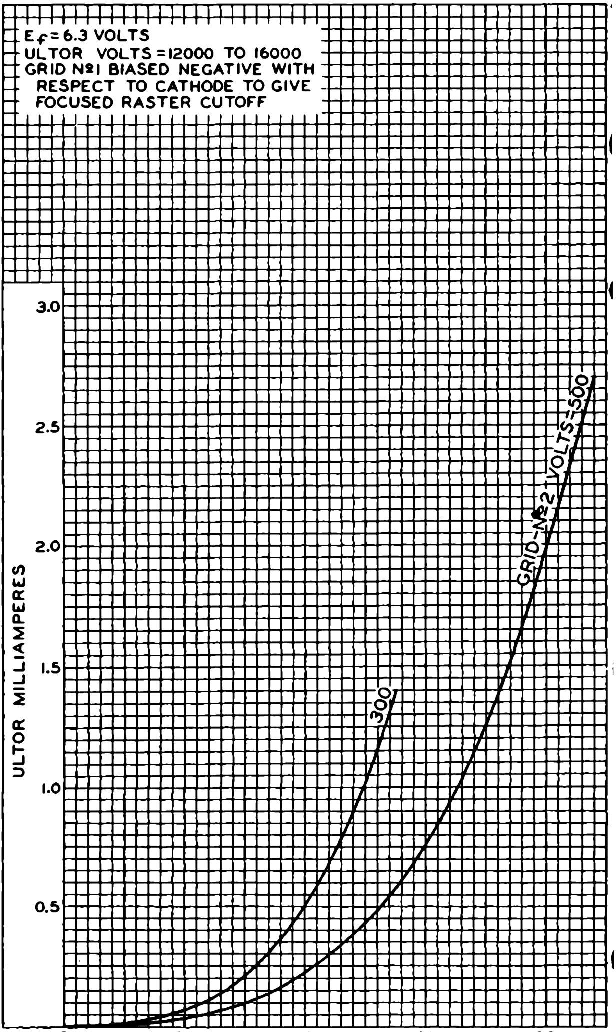
17LP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION 92CM-8870

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

17QP4

KINESCOPE

RECTANGULAR GLASS TYPE

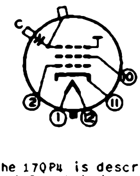
MAGNETIC FOCUS — MAGNETIC DEFLECTION

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	6 μμf
Cathode to All Other Electrodes	5 μμf
External Conductive Coating to Ultor●	1500 max. μμf 750 min. μμf
Faceplate, Cylindrical With Toric Inner Surface†	Filterglass
Light Transmission (Approx.)	66%
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type
Fluorescence and Phosphorescence	White
Persistence of Phosphorescence	Short
Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	70°
Horizontal	65°
Vertical	50°
Ion-Trap Gun	Requires External, Single-Field Magnet
Tube Dimensions:	
Overall Length	19-3/16" ± 3/8"
Greatest Diagonal	16-5/8" ± 1/8"
Greatest Width	15-3/8" ± 1/8"
Greatest Height	12-1/4" ± 1/8"
Minimum Screen Dimensions:	
Greatest Width	14-1/4"
Greatest Height	10-3/4"
Diagonal	15-5/16"
Weight (Approx.)	19 lbs
Mounting Position	Any
Cap	Recessed Small Cavity (JETEC No. J1-21)
Base	Small-Shell Duodecal 5-Pin (JETEC No.B5-57)

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

† The toric surface in the 17QP4 is described by a segment of a circle having a radius of about 60" rotated about a straight line which is (1) parallel to the axis of the outer cylindrical surface, (2) positioned in a plane passing through the axis of the cylindrical surface and the center element thereof, and (3) spaced approximately 25" from the cylindrical surface.

●: See next page.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17QP4

17QP4

KINESCOPE

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

Equipment Design Ranges:

For any ultor voltage (E_u) between 12000# and 16000 volts and grid-No.2 voltage (Ec_2) between 150 and 410 volts

Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	11% to 25.7% of E_{c2}	volts
Grid-No.2 Current	-15 to +15	µamp
Focusing-Coil Current (DC)°°	$\left[\sqrt{\frac{E_u}{12000}} \times 96\right] \pm 6\%$	ma
Field Strength of Single-Field Ion-Trap Magnet (Approx.)**	$\sqrt{\frac{E_u}{12000}} \times 42$	gausses
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	*300*	*300*	*volts*
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-33 to -77	-33 to -77	volts
Focusing-Coil Current (DC)	96 ± 6%	104 ± 6%	ma
Ion-Trap Magnet (Rated Strength)	40	45	gausses

Maximum Circuit Values:

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

● In the 17QP4, 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.

\# Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.

°°,**: See next page.

TUBE DEPARTMENT
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17QP4

KINESCOPE

°° For specimen focusing coil similar to JETEC Focusing Coil No. 109 positioned with air gap toward kinescope screen, and center line of air gap 3 inches from Reference Line (see *Outline Drawing*). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 14-1/4" x 10-3/4" picture area sharply focused at center of screen.

** With a specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No.111 located in optimum position and rotated to give maximum brightness, the ion-trap magnet current is 70 milliamperes dc when the ultor voltage is 12000 volts and grid-No.2 voltage of 300 volts.

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

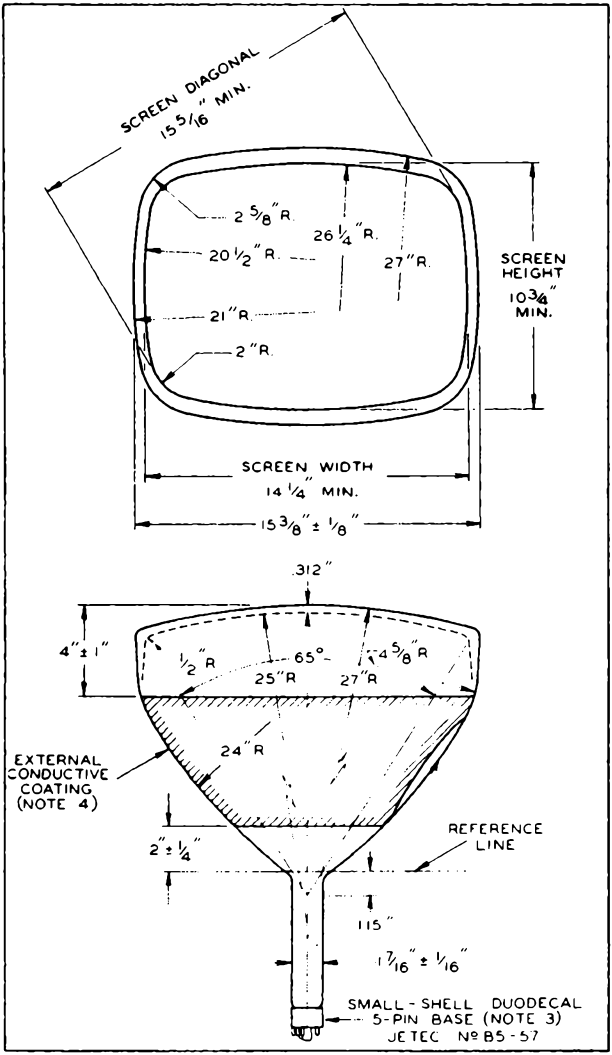
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17QP4

RCA

17QP4

KINESCOPE



JULY 1, 1952

CE-7734R1A

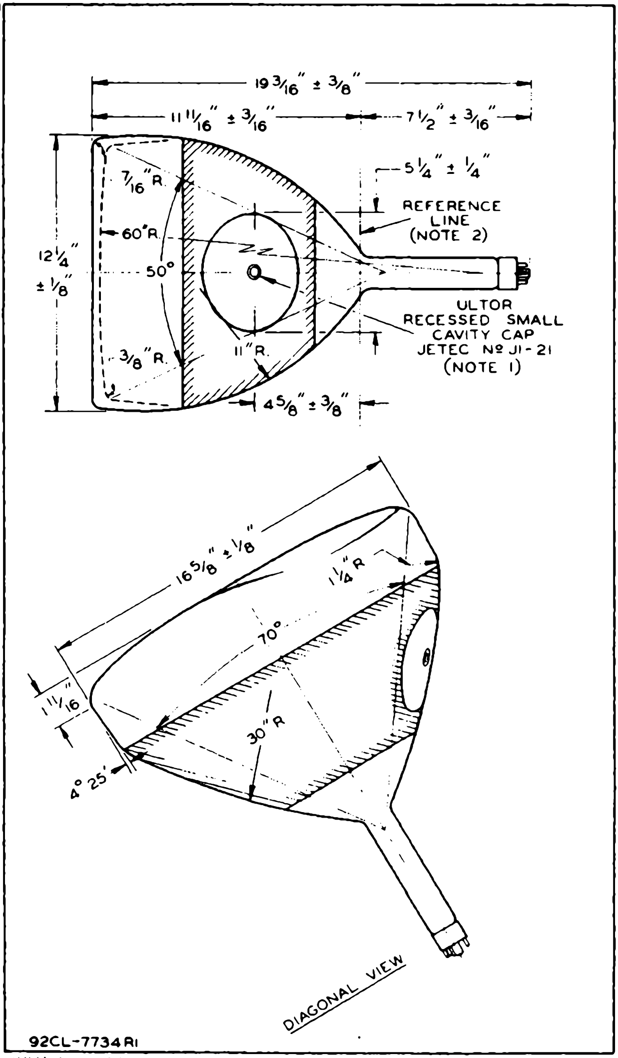
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17QP4

RCA

17QP4

KINESCOPE



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JULY 1, 1952 CE-7734R1B

TUBE DEPARTMENT
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17QP4

17QP4

KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND BULB TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. BULB TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE 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.

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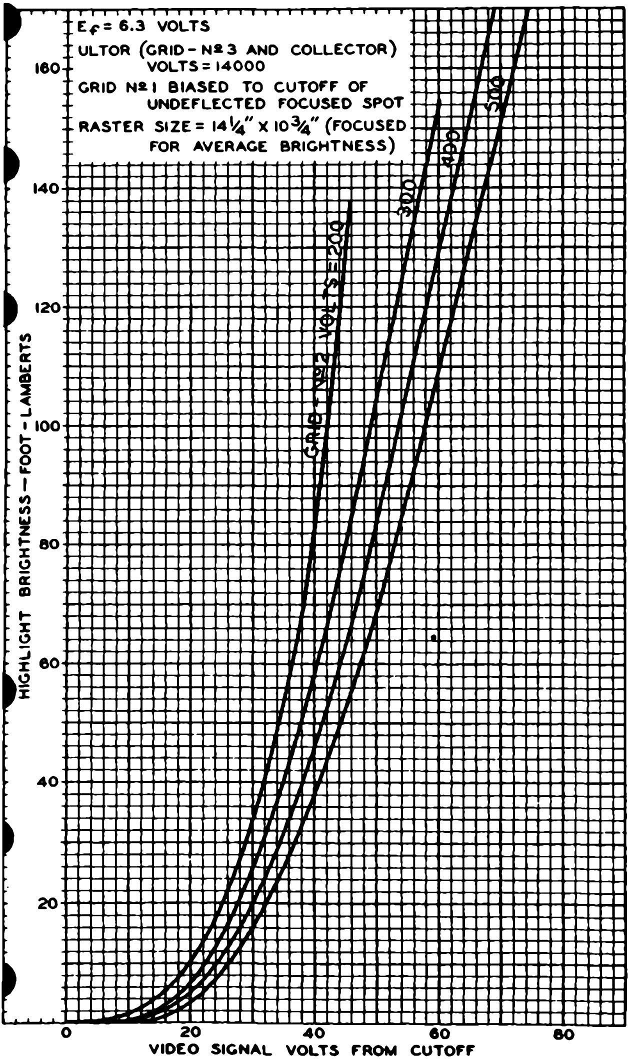
17QP4

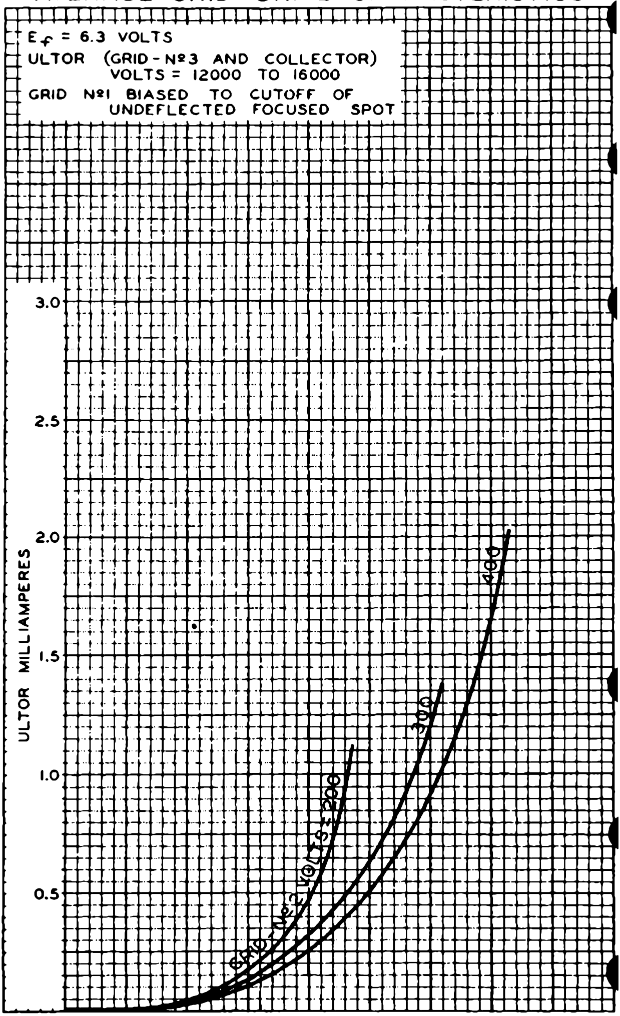
AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

17QP4

AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

17QP4-A

KINESCOPE

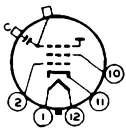
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp
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 750 min. μμf
Faceplate, Cylindrical	Filterglass
Light transmission (Approx.)	72%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	70°
Horizontal	65°
Vertical	50°
Ion-Trap Gun	Requires 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"
Screen Dimensions (Minimum):	
Greatest width	14-1/4"
Greatest height	10-3/4"
Diagonal	15-5/16"
Projected area	140 sq. in.
Weight (Approx.)	19 lbs
Mounting Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Bulb	J-133
Base	Small-Shell Duodecal 5-Pin (JETEC 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

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17QP4-A
KINESCOPE

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	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts

Equipment Design Ranges:

With any ultor voltage (Ec_3) between 14000 and 18000 volts and grid-No.2 voltage (Ec_2) between 150 and 500 volts*

Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of Ec_2	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak positive)	9.3% to 24% of Ec_2	volts
Grid-No.2 Current	-15 to +15	µamp
Focusing-Coil Current (DC)° . .	$\left[\sqrt{\frac{Ec_3}{16000}} \times 111\right] \pm 10\%$	ma
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{Ec_3}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{Ec_3}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*14000*	*volts*
and grid-No.2 voltage of	*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
Focusing-Coil Current (DC) . . .	104 ± 10%	ma
Minimum Field Strength of PM Ion-Trap Magnet	31	gausses

*,°,**,§: see next page.

TUBE DIVISION
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17QP4-A

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 14000 volts.

O For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line *(See Dimensional Outline)*. The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 14-1/4" x 10-3/4" picture size.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No. E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

DIMENSIONAL OUTLINE

for Type 17QP4-A is the same as that shown for Type 17LP4-A, except that the 17QP4-A has a Small-Shell Duodecal 5-Pin Base

HIGHLIGHT BRIGHTNESS vs DRIVE CURVES

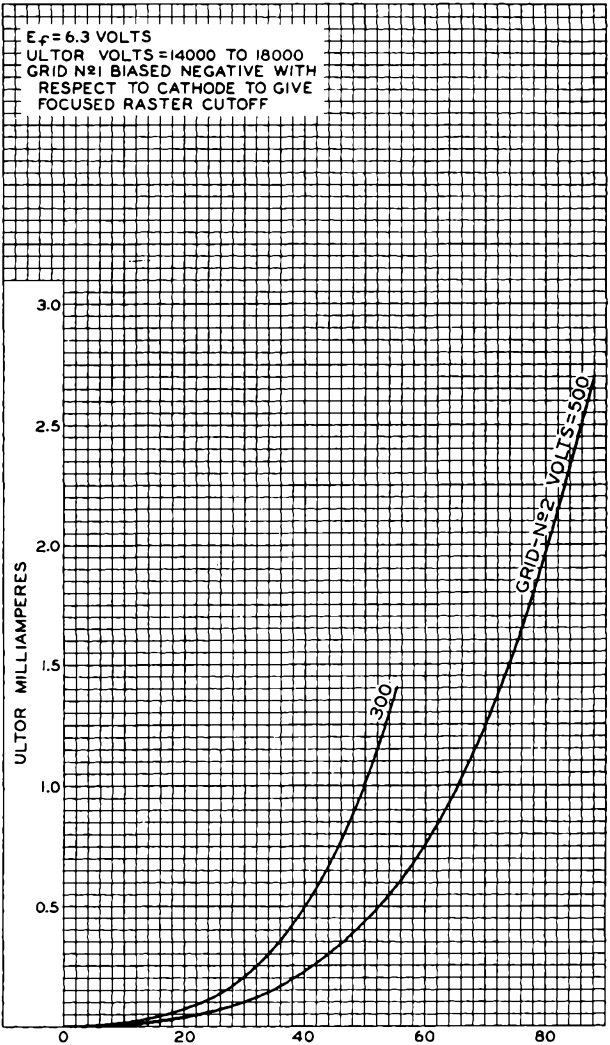
for Type 17QP4-A are the same as those shown for Type 17LP4-A

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17QP4-A

17QP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION 92CM-8869

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17TP4

17TP4
KINESCOPE

RECTANGULAR METAL-SHELL TYPE

LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

DATA

General:

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

Direct Interelectrode Capacitances:
- Grid No.1 to All Other Electrodes . . . . . 6 μμf
- Cathode to All Other Electrodes . . . . . . 5 μμf

Face Plate (With about 66% light transmission) . . . Frosted Filterglass

Phosphor (For Curves, see front of this Section) . . . No.4—Sulfide Type
- Fluorescence and Phosphorescence . . . . White
- Persistence of Phosphorescence . . . . Short

Focusing Method . . . . Electrostatic

Deflection Method . . . . Magnetic

Deflection Angles (Approx.):
- Diagonal . . . . 70°
- Horizontal . . . . 66°
- Vertical . . . . 50°

Ion-Trap Gun . . . . . . Requires External, Single-Field Magnet

Maximum Overall Length . . . . 19-5/16"

Greatest Diagonal of Tube at Lip . . . . . . 16-13/16" ± 3/16"

Greatest Width of Tube at Lip . . . . 15-15/16" ± 1/8"

Greatest Height of Tube at Lip . . . . 12-1/4" ± 1/8"

Screen Size . . . . 14-5/8" x 11"

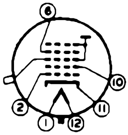
Mounting Position . . . . Any

Ultor● Terminal . . . . Metal-Shell Lip

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

BOTTOM VIEW

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



Pin 12 - Heater
Metal-Shell Lip - Grid No.3, Grid No.5, Collector

Maximum Ratings, *Design-Center Values*:

ULTOR● VOLTAGE	16000 max.	volts
GRID-No.4 VOLTAGE	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
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

●: See next page

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17TP4
KINESCOPE

Equipment Design Ranges:

For any ultor voltage (E_u) between 12000 and 16000 volts and grid-No. 2 voltage (E_{c2}) between 150 and 500 volts*

Grid-No.4 Voltage for Focus With Ultor Current of 100 μamp	0% to 2.5% 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.4 Current.	-25 to +25	μamp
Grid-No.2 Current.	-15 to +15	μamp
Field Strength of Single-Field Ion-Trap Magnet (Approx.)**	$\sqrt{\frac{E_u}{12000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

For ultor voltage of. . .	*14000*	*16000*	*volts*
and grid-No. 2 voltage of.	*300*	*300*	*volts*
Grid-No.4 Voltage for Focus With Ultor Current of 100 μamp	0 to 350	0 to 400	volts
Grid-No.1 Voltage†	-33 to -77	-33 to -77	volts
Ion-Trap Magnet (Rated Strength)	35	40	gausses

Maximum Circuit Values:

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

● In the 17TP4, grid No.5 which has the ultor function, grid No.3, 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.

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 12000 volts.

** With a specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No. 111 located in optimum position and rotated to give maximum brightness, the ion-trap magnet current is 65 milliamperes dc when the ultor voltage is 14000 volts.

† For visual extinction of undeflected focused spot.

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17TP4
KINESCOPE

OPERATING NOTES

X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, the 17TP4 does not produce any harmful x-ray radiation, However, because the rating of the tube permits operation at voltages as high as 17.6 kilovolts (absolute value), shielding of the 17TP4 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.

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

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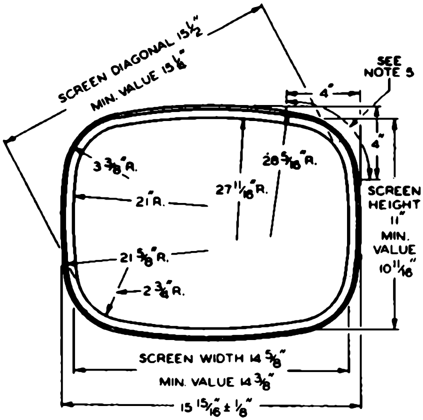
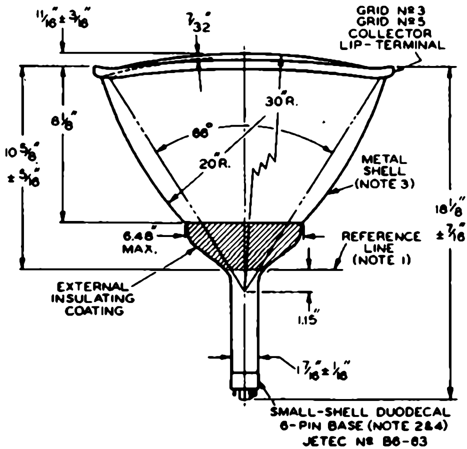
17TP4
KINESCOPE





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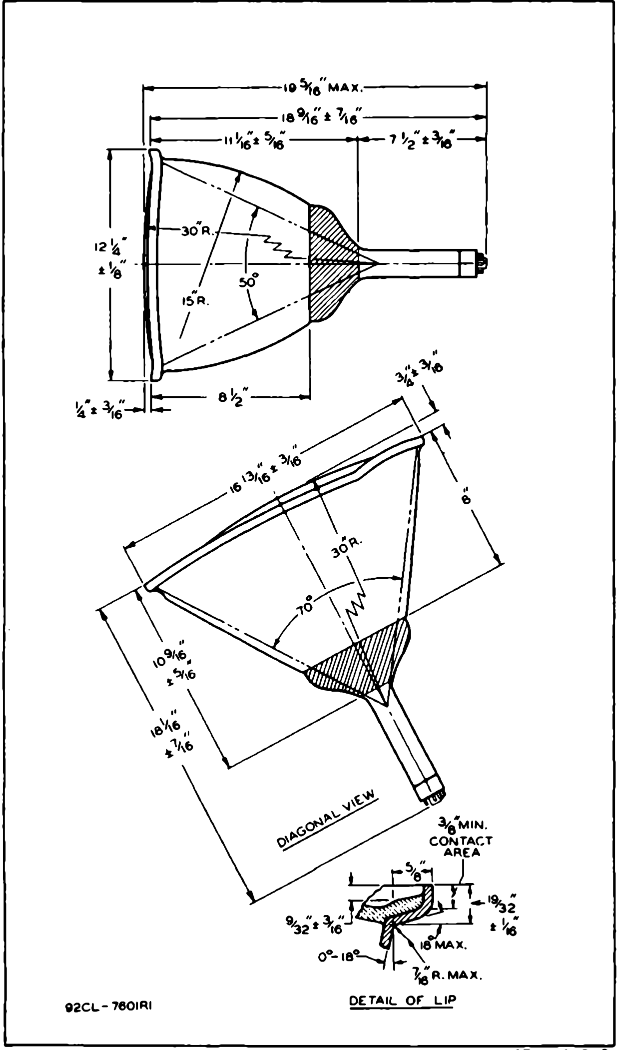
17TP4
KINESCOPE



RCA

17TP4
KINESCOPE

NOTE 1: 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 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 2-3/4".

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.

NOTE 4: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE HORIZONTAL AXIS OF THE GLASS FACE BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 10^\circ$.

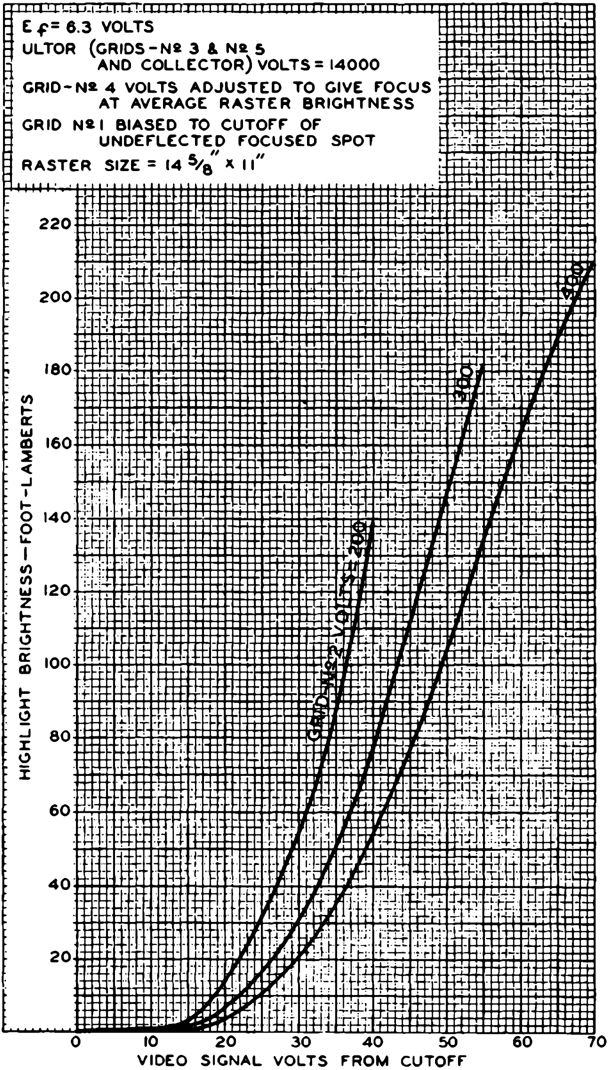
NOTE 5: SUPPORT TUBE BY LIP ONLY AT CORNERS WITHIN THIS SPACE.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

17TP4

17TP4

AVERAGE GRID-DRIVE CHARACTERISTICS



FEB. 8, 1951

TUBE DEPARTMENT
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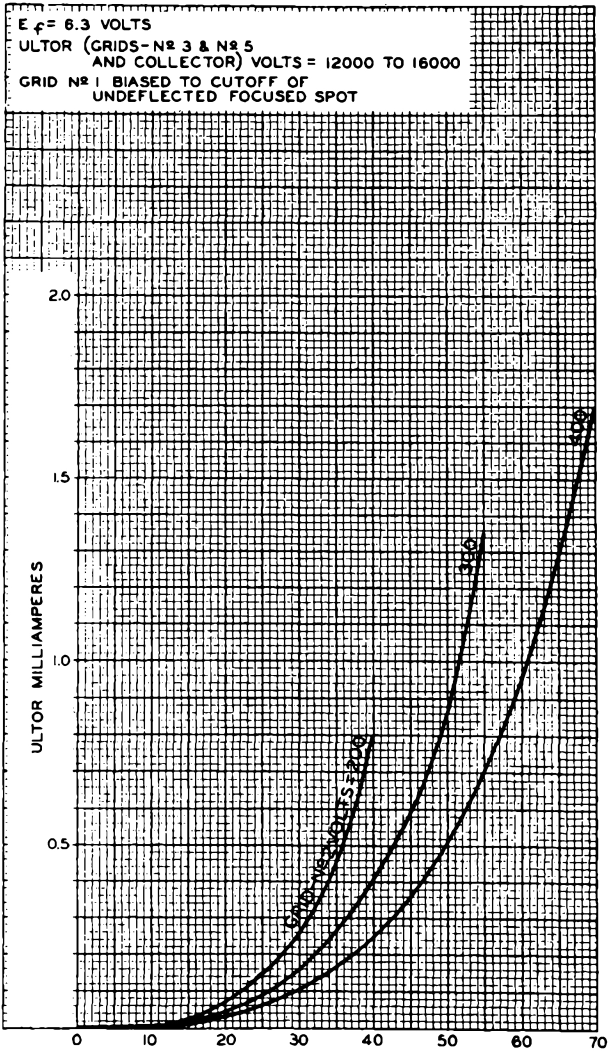
92CM-7606

17TP4

AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

19AP4

KINESCOPE

The 19AP4 is like the 19AP4-B except that it has a face plate made of ***unfrosted, clear glass.*** As a result, the light output is about 30% greater than shown by the curves under Type 19AP4-B.

19AP4-A

KINESCOPE

The 19AP4-A is like the 19AP4-B except that it has an ***unfrosted Filterglass*** face plate. The light output is essentially the same as that of the Type 19AP4-B.

As soon as feasible, the 19AP4-B will supersede the 19AP4 and 19AP4-A.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

19AP4-B
KINESCOPE

METAL-CONE ENVELOPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

Supersedes Type 19AP4-A

DATA

General:

Heater, for Unipotential Cathode:

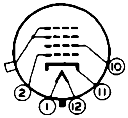
Voltage	6.3	ac or dc volts
Current	0.6	amp

Direct Interelectrode Capacitances (Approx.):

Grid No.1 to All Other Electrodes	7	$\mu\mu f$
Cathode to All Other Electrodes	5	$\mu\mu f$

Face Plate▲	Frosted RCA "Filterglass"
Phosphor (For Curves, see front of this Section)	No.4-Sulfide Type
Fluorescence and Phosphorescence	White
Persistence of Phosphorescence	Medium
Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angle (Approx.)	66°
Ion-Trap Gun	Requires External Single-Field Magnet
Overall Length	21-1/2" ± 1/2"
Greatest Diameter of Envelope	18-5/8" ± 1/8"
Screen Diameter	17-3/8"
Mounting Position	Any
Anode Terminal	Metal-Cone Lip
Base	Small-Shell Duodecal 5-Pin
Basing Designation for BOTTOM VIEW	$12D_1$

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



Pin 12 - Heater
Metal-Cone Lip: Anode, Grid No.3

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

ANODE□ VOLTAGE●	19000 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

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

● The product of anode voltage and average anode current should be limited to 6 watts.

▲ Has transmission of about 65%.

SEPT. 1, 1950 — TUBE DEPARTMENT — TENTATIVE DATA
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

19AP4-B

19AP4-B
KINESCOPE

Typical Operation:

Anode Voltage*	12000	14000	volts
Grid-No.2 Voltage.	300	300	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-33 to -77	-33 to -77	volts
Focusing-Coil Current (DC, Approx.)●. . . .	140	150	ma
Ion-Trap Magnet Current (DC, Approx.)#. . . .	75	80	ma
Field Strength of Single-Field, Ion-Trap Magnet (Approx.)†	45	50	gausses

Maximum Circuit Values:

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

Minimum Circuit Values:

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

Grid-No.1-Circuit Resistance.	150 min.	ohms
Grid-No.2-Circuit Resistance.	470 min.	ohms
Anode-Circuit Resistance	22000 min.	ohms

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

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 12000 volts.

● For JETEC Focusing Coil No.106, or equivalent, positioned with air gap toward kinescope screen, and center line of air gap about 3 inches from Reference Line (see Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 18 foot-lamberts for 12000 volts, or 22 foot-lamberts for 14000 volts, on a 15-5/8" x 11-3/4" picture area.

For JETEC Ion-Trap Magnet No.111, or equivalent, located in optimum position and rotated to give maximum brightness.

† Measured at center of field with General Electric Gauss Meter, Cat. No.409X51.

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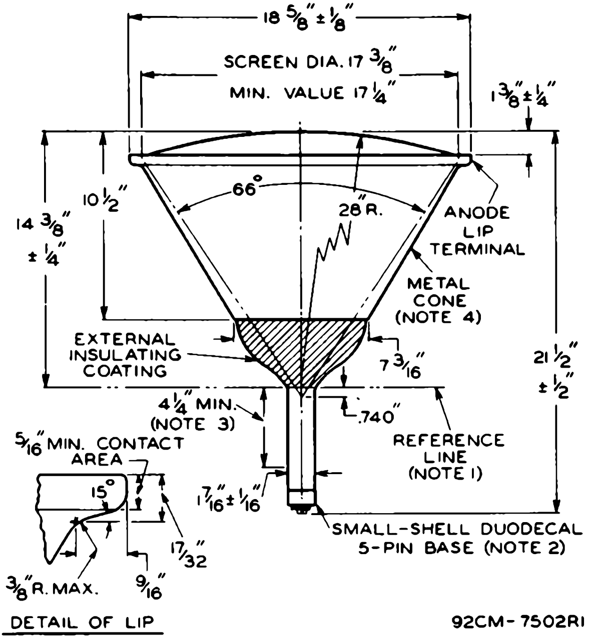
19AP4-B
KINESCOPE



NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + .003" - .000" I.D. AND 2" LONG WILL REST ON CONE.

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 CONE AXIS AND HAVING DIAMETER OF 3".

NOTE 3: LOCATION OF DEFLECTING YOKE AND FOCUSING COIL MUST BE WITHIN THIS SPACE.

NOTE 4: METAL CONE AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE CONE OR THE FACE MUST HAVE INSULATING PROPERTIES ADEQUATE TO WITHSTAND THE APPLIED ANODE VOLTAGE PLUS 10%.

TUBE DEPARTMENT
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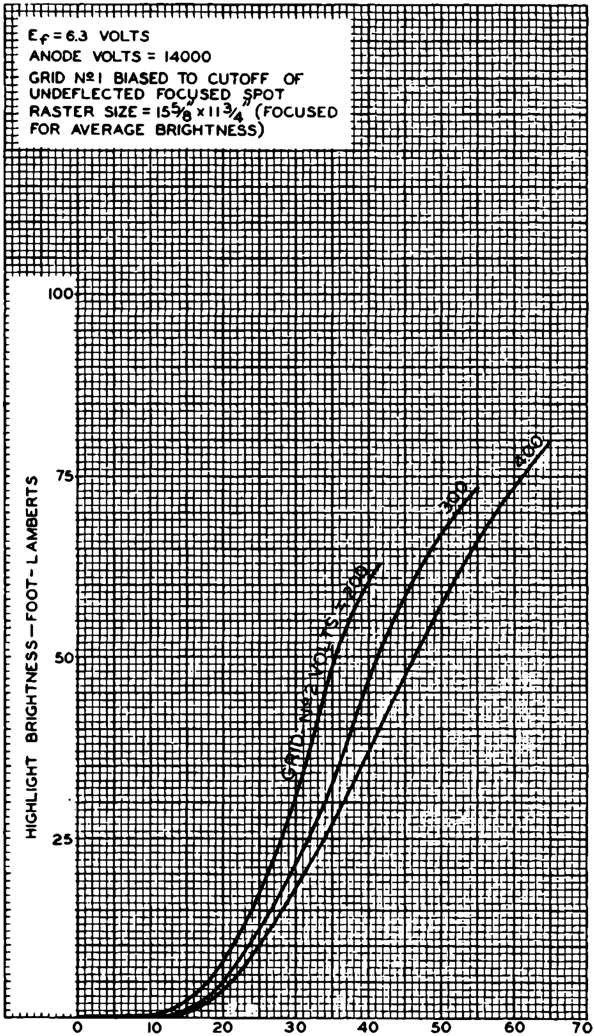
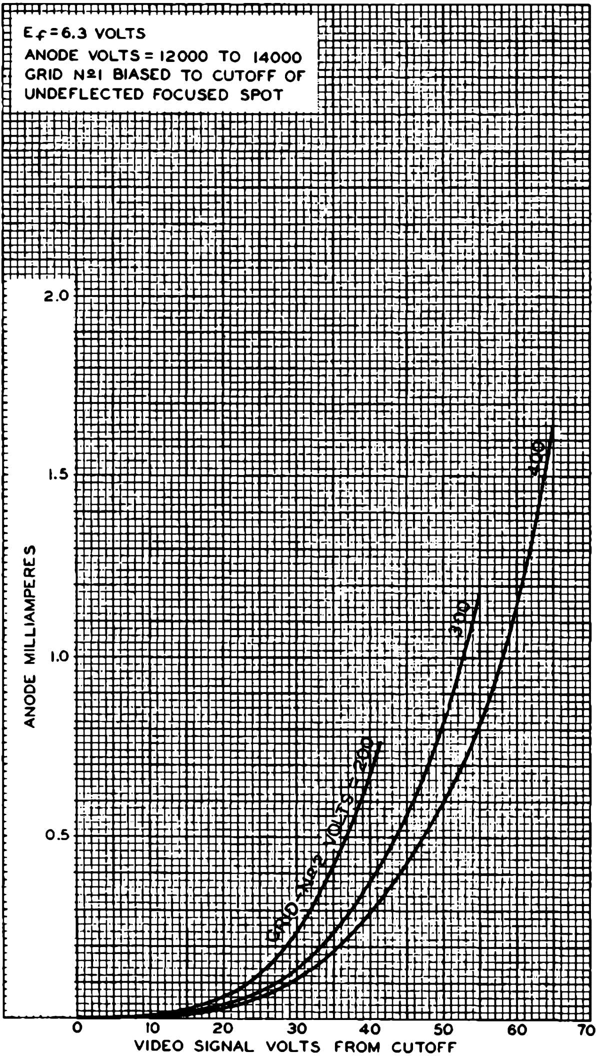
19AP4-B

AVERAGE GRID-DRIVE CHARACTERISTICS



19AP4-B

AVERAGE GRID-DRIVE CHARACTERISTICS



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19AP4-D

KINESCOPE

The 19AP4-D is like the 19AP4-B except that it has a face plate made of ***frosted, clear glass.*** As a result, the light output is about 30% greater than shown by the curves under Type 19AP4-B.

As soon as feasible, the 19AP4-B will supersede the 19AP4-D.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

20CP4
KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

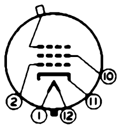
DATA

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	6	$\mu\mu f$
Cathode to All Other Electrodes	5	$\mu\mu f$
Face Plate (With about 66% light transmission)		Filterglass
Phosphor (For Curves, see front of this Section)		No.4-Sulfide Type
Fluorescence and Phosphorescence		White
Persistence of Phosphorescence		Short
Focusing Method		Magnetic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		70°
Horizontal		66°
Vertical		50°
Ion-Trap Gun		Requires External, Single-Field Magnet
Overall Length		21-7/16" ± 3/8"
Greatest Diagonal of Tube at Face		20-3/32" ± 3/16"
Greatest Width of Tube at Face		18-11/16" ± 3/16"
Greatest Height of Tube at Face		14-15/16" ± 3/16"
Screen Size		17-1/4" x 13-1/4"
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 - Anode

Maximum Ratings, *Design-Center Values*:

ANODE VOLTAGE	18000 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

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20CP4

KINESCOPE

Typical Operation:

Anode Voltage*	14000	16000	volts
Grid-No.2 Voltage.	300	300	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-33 to -77	-33 to -77	volts
Focusing-Coil Current (DC)□.	104 ± 10%	110 ± 10%	ma
Field Strength of Single-Field, Ion-Trap Magnet (Approx.)†	50	55	gausses

Maximum Circuit Values:

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

* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 14000 volts.

□ For specimen focusing coil similiar to JETEC Focusing Coil No.109, positioned with air gap toward kinescope screen, and center line of air gap about 3 inches from Reference Line (see Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 17" x 12-3/4" picture area sharply focused at center of screen.

† Measured at center of field with General Electric Gauss Meter, Cat. No.409X51.

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20CP4

KINESCOPE

OPERATING NOTES

X-Ray Warning. When operated at or below 16000 volts, the 20CP4 does not produce any harmful x-ray radiation. In general, picture tubes may be operated at voltages (if ratings permit) up to 16000 volts without personal injury on prolonged exposure at close range. Above 16000 volts, special shielding precautions for x-ray radiation may be necessary.

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

20CP4

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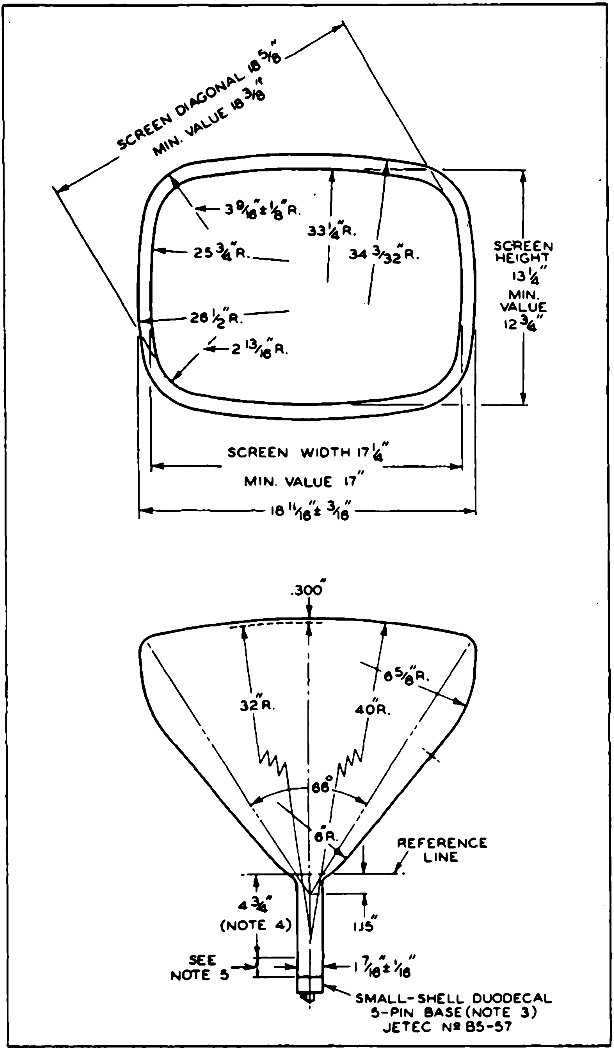
20CP4

KINESCOPE



TUBE DEPARTMENT
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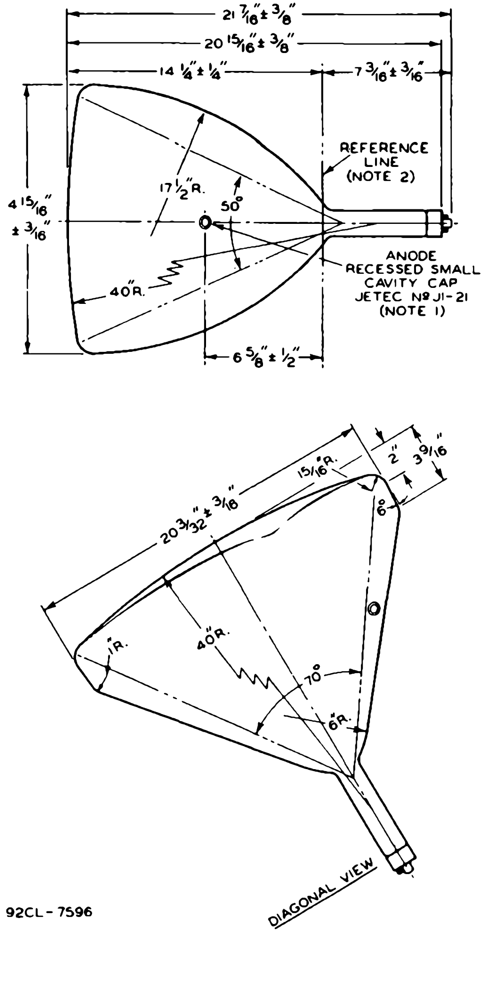
20CP4

20CP4

KINESCOPE



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20CP4

KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No. 110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE 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".

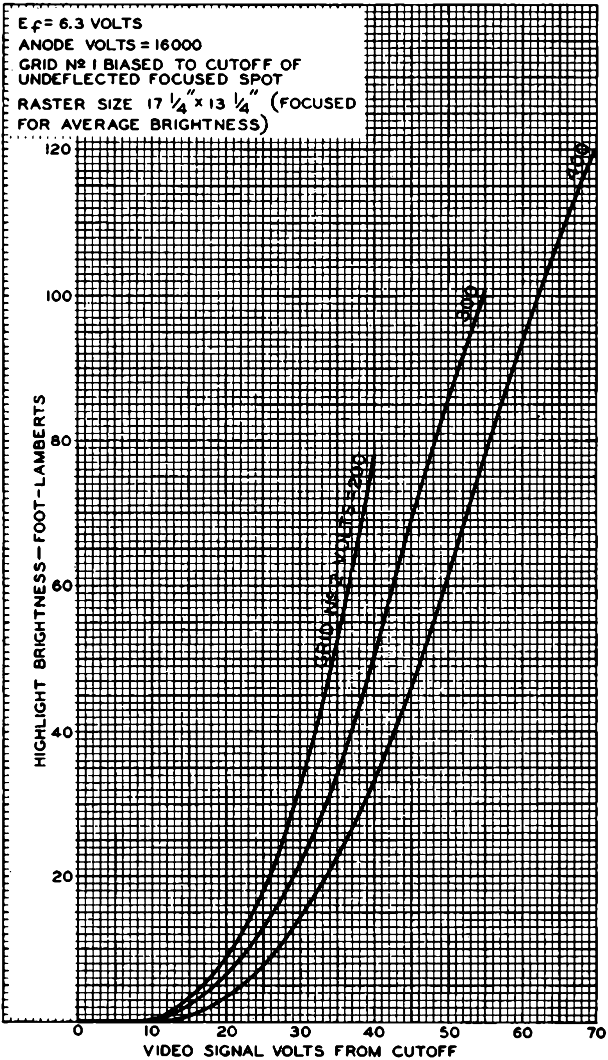
NOTE 4: LOCATION OF DEFLECTING YOKE AND FOCUSING DEVICE MUST BE WITHIN THIS SPACE.

NOTE 5: KEEP THIS SPACE CLEAR FOR SINGLE-FIELD, ION-TRAP MAGNET.

20CP4

20CP4

AVERAGE GRID-DRIVE CHARACTERISTICS



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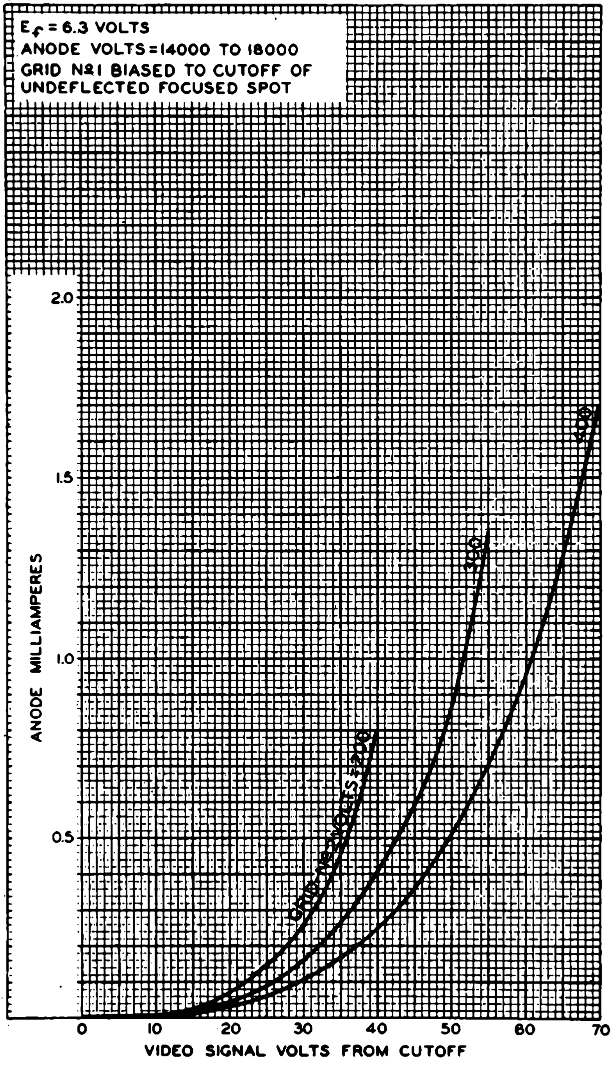
20CP4

AVERAGE GRID-DRIVE CHARACTERISTICS



20DP4-A/20CP4-A

KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS MAGNETIC DEFLECTION

The 20DP4-A/20CP4-A is the same as the 20DP4-C/20CP4-D except that it utilizes a ***non-aluminized phosphor*** and has a light output as shown by the curves on the back of this sheet.

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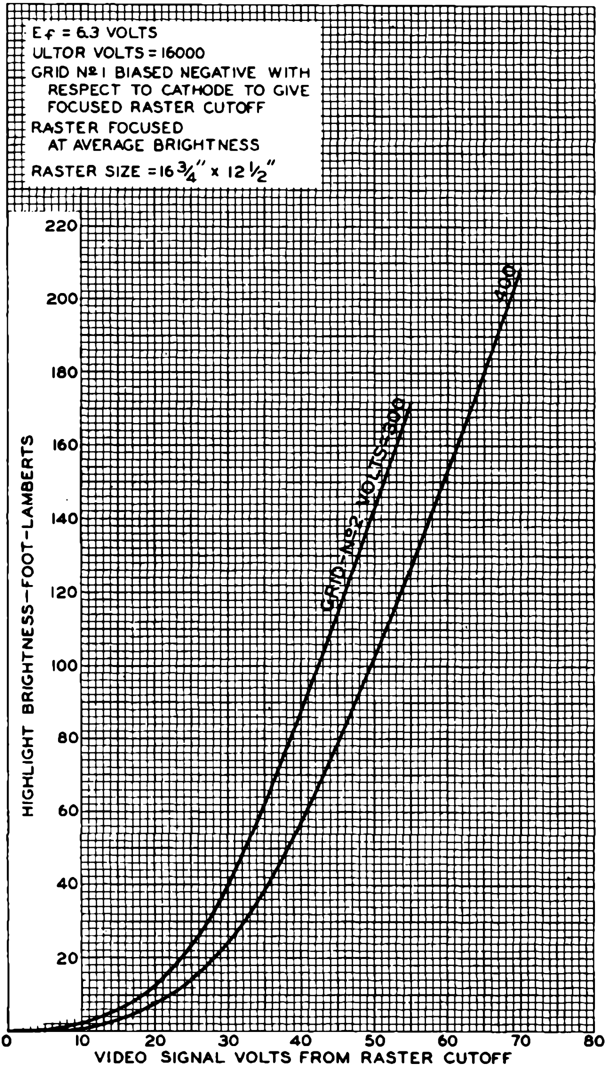
20DP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



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20DP4-C/20CP4-D

KINESCOPE

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

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. μμf / 500 min. μμf

Faceplate, Spherical . . . . Filterglass
- Light transmission (Approx.) 73%

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

Focusing Method . . . . Magnetic

Deflection Method . . . . Magnetic

Deflection Angles (Approx.):
- Diagonal . . . . 70°
- Horizontal . . . . 66°
- Vertical . . . . 50°

Ion-Trap Gun . . . . . . Requires External Single-Field Magnet

Tube Dimensions:
- Overall length . . . . 21-9/16" ± 5/16"
- Greatest width . . . . 18-11/16" ± 1/8"
- Greatest height . . . . 14-15/16" ± 1/8"
- Diagonal . . . . 20-3/32" ± 1/8"
- Neck length . . . . 7-5/16" ± 1/8"

Screen Dimensions (Minimum):
- Greatest width . . . . 17"
- Greatest height . . . . 12-3/4"
- Diagonal . . . . 18-3/8"
- Projected area . . . . 199 sq. in.

Weight (Approx.) . . . . 30 lbs

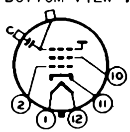
Mounting Position . . . . Any

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

Bulb J-161

Base . . . . Small-Shell Duodecal 5-Pin (JETEC 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

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20DP4-C

KINESCOPE

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

ULTOR VOLTAGE	18000 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

Equipment Design Ranges:

With any ultor voltage (Ec_3) between 14000* and 18000 volts and grid-No.2 voltage (Ec_2) between 150 and 410 volts

Grid-No.1 Voltage for Visual Extinction of Focused Raster	−9.3% to −24% of Ec_2	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak positive)	9.3% to 24% of Ec_2	volts
Grid-No.2 Current	−15 to +15	µamp
Focusing-Coil Current (DC)°	$\left[\sqrt{\frac{Ec_3}{16000}} \times 110\right] \pm 10\%$	ma
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{Ec_3}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet §	$\sqrt{\frac{Ec_3}{16000}} \times 33$	gausses
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*	*300*	*volts*
Grid-No.1 Voltage for Visual Extinction of Focused Raster	−28 to −72	−28 to −72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	28 to 72	volts
Focusing-Coil Current (DC)	103 ± 10%	110 ± 10%	ma
Minimum Field Strength of PM Ion-Trap Magnet	31	33	gausses

*,°,**,§: See next page.

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20DP4-C

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 14000 volts.

o For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line *(See Dimensional Outline)*. The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 17" x 12-3/4" picture size.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

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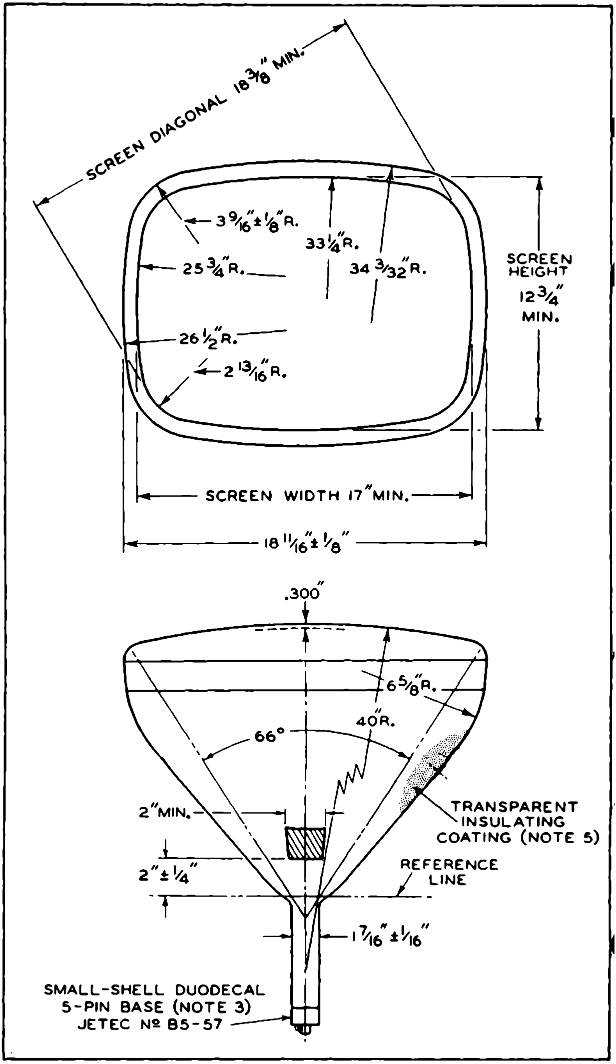
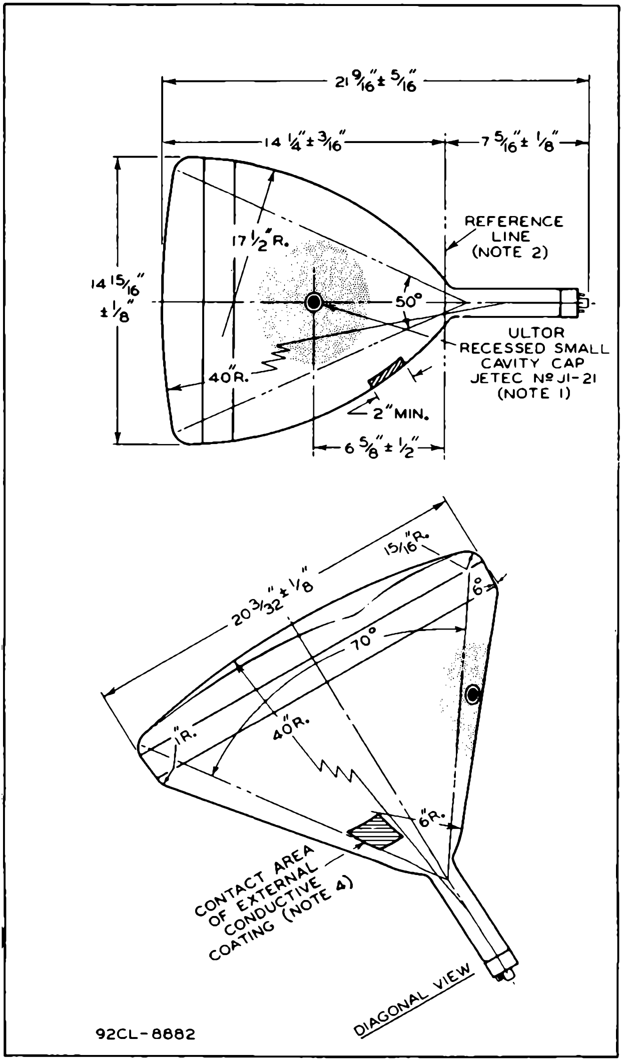
20DP4-C
KINESCOPE



20DP4-C

KINESCOPE



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20DP4-C

KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.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 VACANT PIN POSITION No.6.

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

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

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

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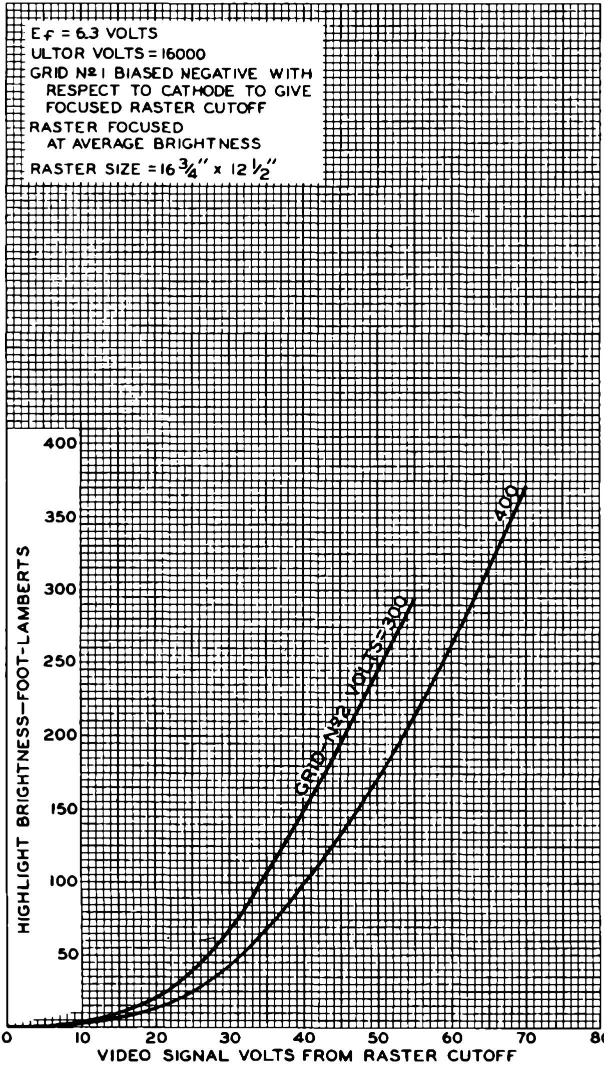
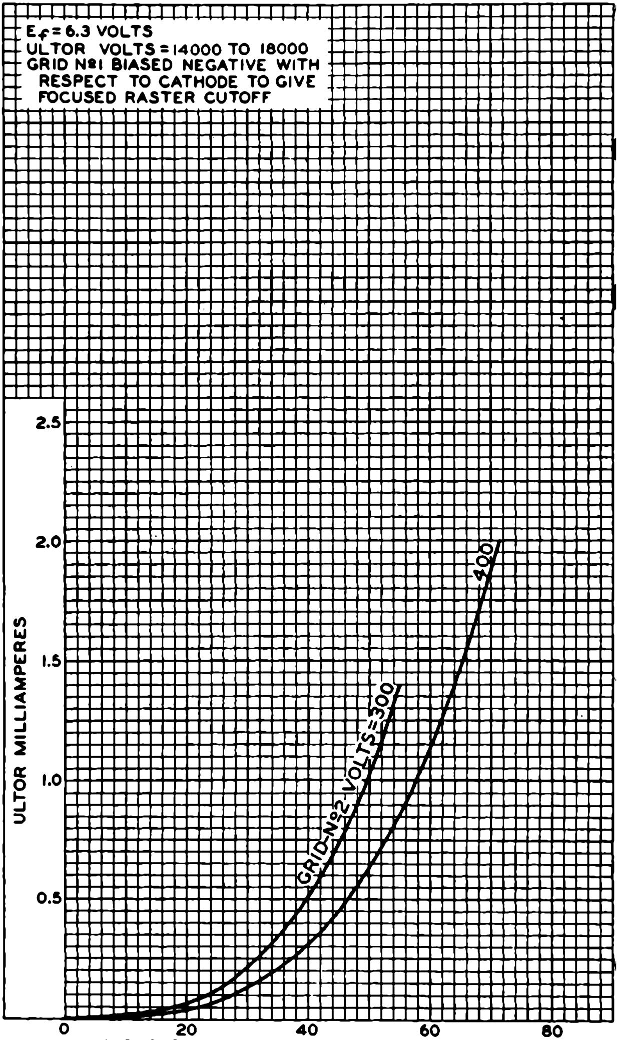
20DP4-C

AVERAGE GRID-DRIVE CHARACTERISTICS



20DP4-C

AVERAGE GRID-DRIVE CHARACTERISTICS



20HP4-A/20MP4

KINESCOPE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

The 20HP4-A/20MP4 is the same as the 20HP4-D except that it utilizes a *non-aluminized phosphor* and has a light output as shown by the curves on the back of this sheet.

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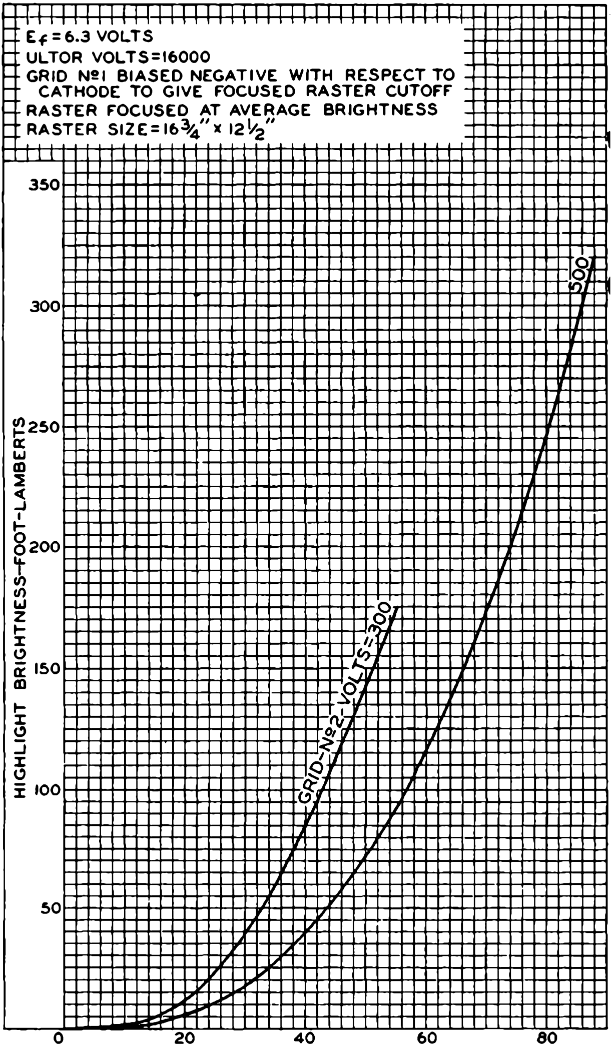
20HP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



20HP4-D

KINESCOPE

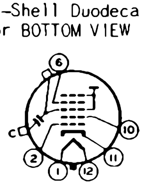
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	1500 max.	μμf
	750 min.	μμf
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		73%
Phosphor (For curves, see front of this Section)		P4—Sulfide Type Aluminized
Fluorescence		White
Phosphorescence		White
Persistence		Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		70°
Horizontal		66°
Vertical		50°
Ion-Trap Gun		Requires External Single-Field Magnet
Tube Dimensions:		
Overall length		21-3/4" ± 3/8"
Greatest width		18-11/16" ± 1/8"
Greatest height		14-15/16" ± 1/8"
Diagonal		20-3/32" ± 1/8"
Neck length		7-1/2" ± 3/16"
Screen Dimensions (Minimum):		
Greatest width		17"
Greatest height		12-3/4"
Diagonal		18-3/8"
Projected area		199 sq. in.
Weight (Approx.)		30 lbs
Mounting Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Bulb		J-161
Base		Small-Shell Duodecal 6-Pin (JETEC No.B6-63)
Basing Designation for BOTTOM VIEW		12L

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



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

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20HP4-D

KINESCOPE

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	16000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	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

Equipment Design Ranges:

With any ultor voltage (Ec_5) between 14000# and 16000 volts and grid-No.2 voltage (Ec_2) between 150 and 500 volts

Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp	-0.4% to +2.2% of Ec_5	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of Ec_2	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	9.3% to 24% of Ec_2	volts
Grid-No.4 Current	-25 to +25	μamp
Grid-No.2 Current	-15 to +15	μamp
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{Ec_5}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet §	$\sqrt{\frac{Ec_5}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 14000 volts.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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20HP4-D

KINESCOPE

Examples of Use of Design Ranges:

With ultor voltage of	*14000*	*16000*	*volts*
and grid-No.2 voltage of	*300*	*300*	*volts*
Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp. . .	-55 to +300	-65 to +350	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	28 to 72	volts
Minimum Field Strength of PM Ion-Trap Magnet . . .	31	33	gausses

Maximum Circuit Values:

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

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

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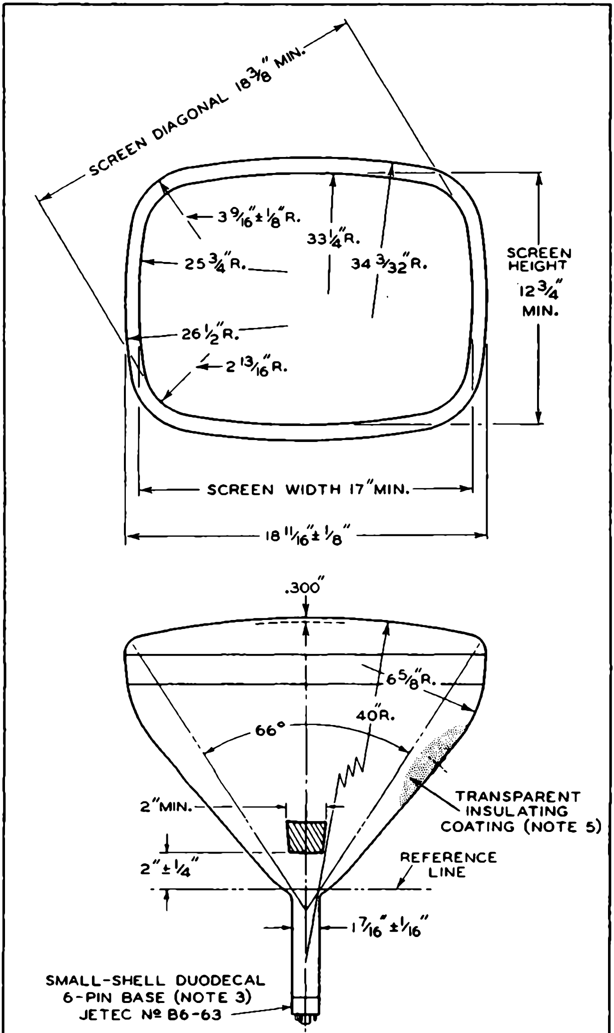
20HP4-D
KINESCOPE



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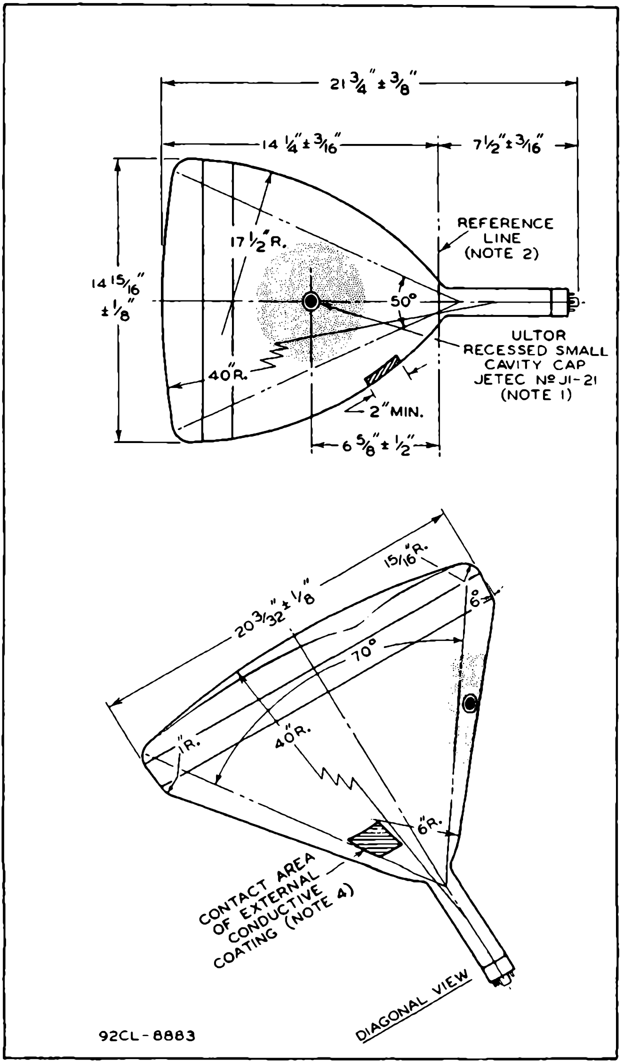
20HP4-D
KINESCOPE



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20HP4-D

20HP4-D
KINESCOPE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm 30^{\circ}$. ULTOR TERMINAL IS ON SAME SIDE AS PIN No.6.

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

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

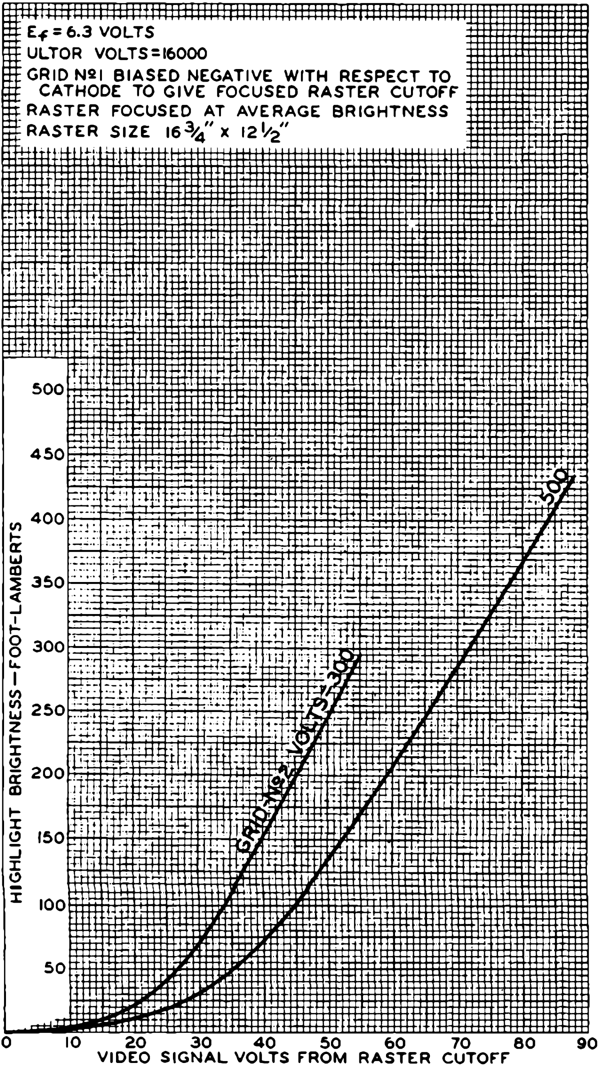
NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

RCA

20HP4-D

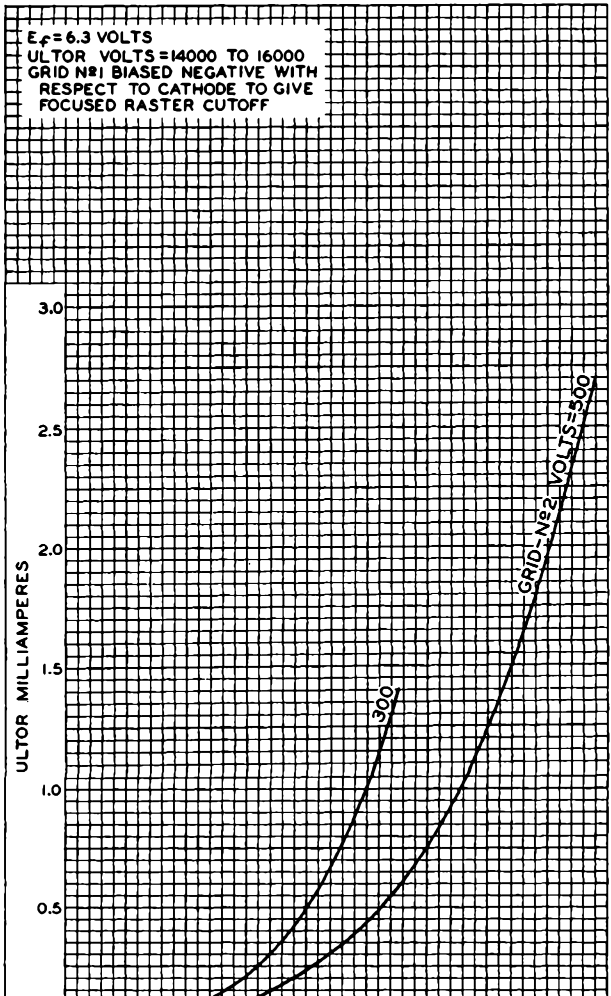
AVERAGE GRID-DRIVE CHARACTERISTICS



RCA

20HP4-D

AVERAGE GRID-DRIVE CHARACTERISTICS



TUBE DIVISION 92CM-8871

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21ACP4-A

KINESCOPE

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

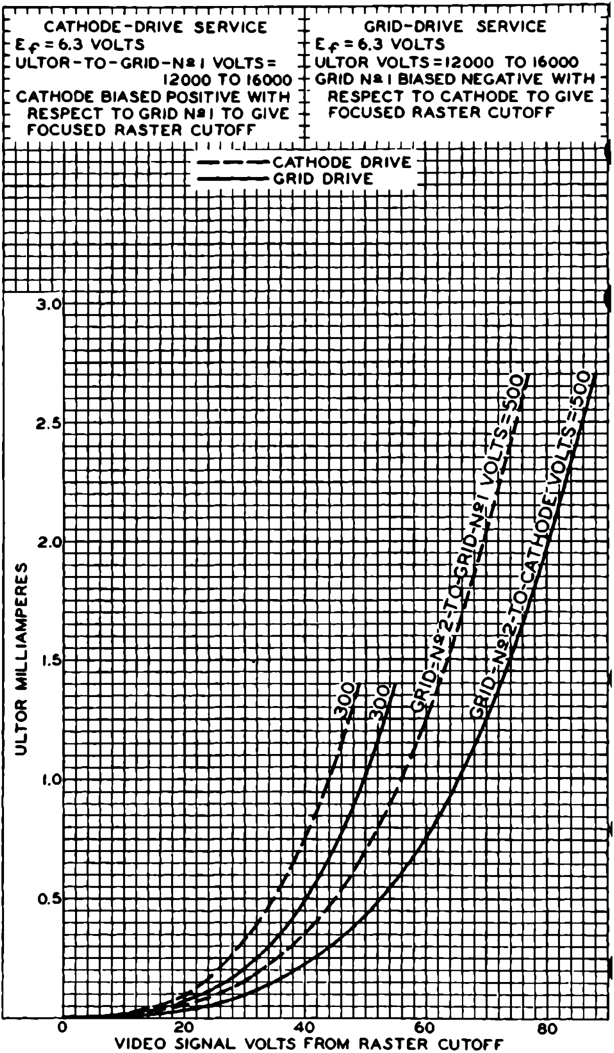
The 21ACP4-A is the same as the 21AMP4-A except that it has a *maximum ultor voltage rating* of 20000 volts and has ULTOR CURRENT vs DRIVE curves as shown on the back of this sheet.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21ACP4-A

21ACP4-A

AVERAGE DRIVE CHARACTERISTICS



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8904

21ALP4-A
KINESCOPE

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

DATA

General:

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

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . . 6 μμf
- Cathode to all other electrodes . . . . . 5 μμf
- External conductive coating to ultor● . . {750 max. μμf; 500 min. μμf}

Faceplate, Spherical . . . . Filterglass
- Light transmission (Approx.) 75%

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

Focusing Method . . . . Electrostatic
Deflection Method . . . . Magnetic

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

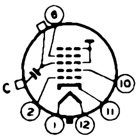
Ion-Trap Gun . . . . . Requires External Single-Field Magnet

Tube Dimensions:
- Overall length . . . . 20" ± 3/8"
- Greatest width . . . . 20-1/4" ± 1/8"
- Greatest height . . . . 16-3/8" ± 1/8"
- Diagonal . . . . 21-3/8" ± 1/8"

Screen Dimensions (Minimum):
- Greatest width . . . . 19-1/8"
- Greatest height . . . . 15"
- Diagonal . . . . 20-1/4"
- Projected area . . . . 255 sq. in.

Weight (Approx.) . . . . 24 lbs
Mounting Position . . . . Any
Cap . . . . Recessed Small Cavity (JETEC No.J1-21)
Bulb . . . . J171 (90°) ←
Base . . . . Small-Shell Duodecal 6-Pin (JETEC No.B6-63)
- Basing Designation 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

●: See next page.

← indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

21ALP4-A

KINESCOPE

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR● VOLTAGE	18000	max.	volts
GRID-No.4 VOLTAGE:			
Positive value	1000	max.	volts
Negative value*	500	max.	volts
GRID-No.2 VOLTAGE	500	max.	volts
GRID-No.1 VOLTAGE:			
Negative bias value	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

Equipment Design Ranges:

With any ultor voltage (E_{c_5k}) between 14000# and 18000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp.	-0.4% to +2.2% of E_{c_5k}	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of E_{c_2k}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak positive)	9.3% to 24% of E_{c_2k}	volts
Grid-No.4 Current	-25 to +25	μamp
Grid-No.2 Current	-15 to +15	μamp
→ Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_5k}}{16000}} \times 30$	ma
→ Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_5k}}{16000}} \times 33$	gausses
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.

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21ALP4-A

21ALP4-A

KINESCOPE

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*18000*	*volts*
and grid-No.2 voltage of	*300*	*400*	*volts*
Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp. . . .	-65 to +350	-75 to +400	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-37 to -96	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	37 to 96	volts
Minimum Field Strength of PM Ion-Trap Magnet	33	35	gausses ←

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR●-TO-GRID-No.1 VOLTAGE.	18000 max.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value	1000 max.	volts
Negative value*.	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value.	125 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

● 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 21ALP4-A, the ultor function is performed by grid No.5. Since grid No.5, grid No.3, and collector are connected together within the 21ALP4-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

* This value has been specified to take care of the condition where an ac voltage is provided for dynamic focusing.

■ 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. ← Indicates a change.

21ALP4-A

KINESCOPE

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) between 14000# and 18000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 220 and 620 volts

Grid-No.4-to-Grid-No.1 Voltage for Focus with Ultor Current of 100 μamp.	0% to 2.6% of $E_{c_5g_1}$	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster.	8.5% to 19.4% of $E_{c_2g_1}$	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak negative)	8.5% to 19.4% of $E_{c_2g_1}$	volts
Grid-No.4 Current.	-25 to +25	μamp
Grid-No.2 Current.	-15 to +15	μamp
→ Ion-Trap Magnet Current (Average)**.	$\sqrt{\frac{E_{c_5g_1}}{16000}} \times 30$	ma
→ Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_5g_1}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for Focus with Ultor Current of 100 μamp.	0 to 415	0 to 470	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster.	25 to 58	34 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak negative)	25 to 58	34 to 78	volts
→ Minimum Field Strength of PM Ion-Trap Magnet	33	35	gausses

Maximum Circuit Values:

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

#,**,§: See next page. → Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21ALP4-A

KINESCOPE

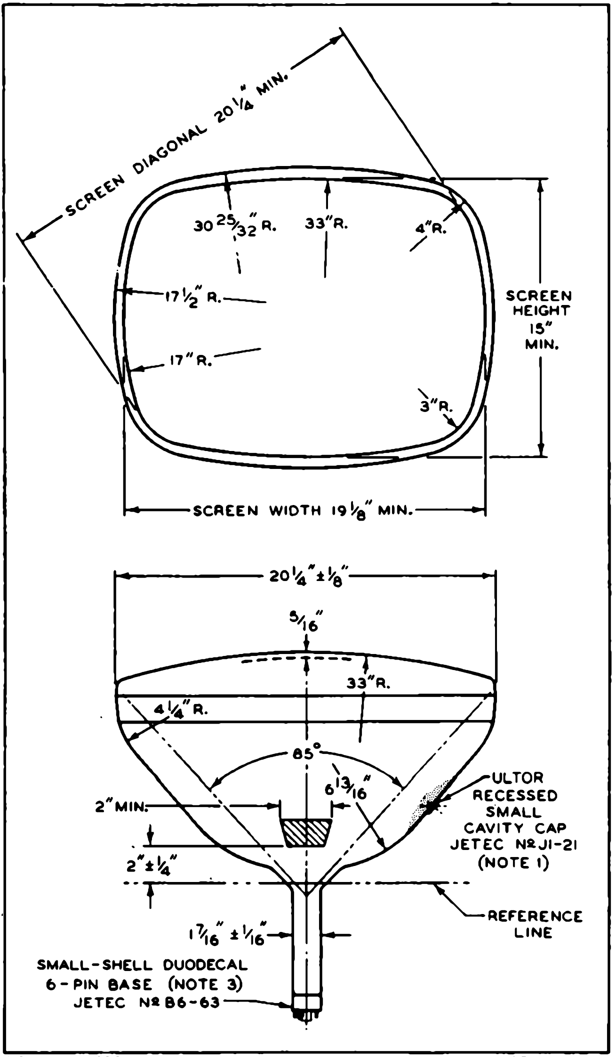
\# Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 14000 volts.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

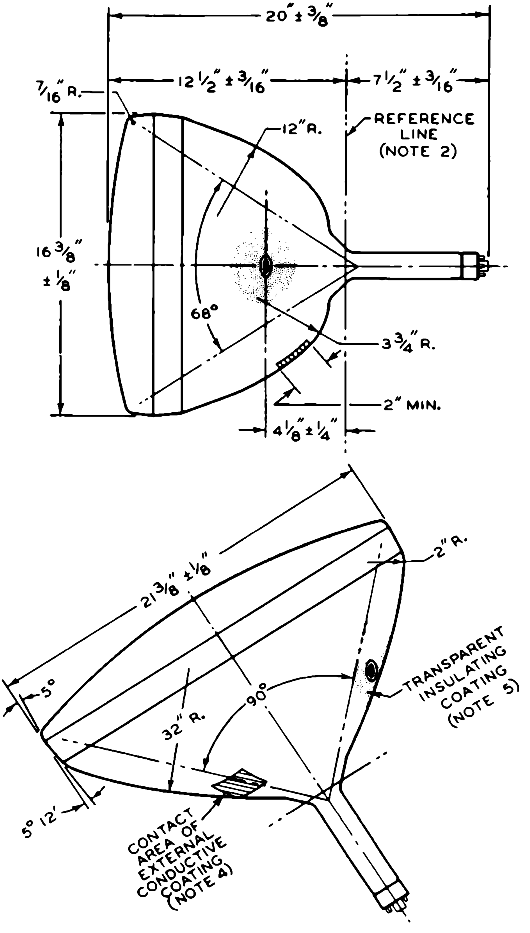
21ALP4-A
KINESCOPE



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21ALP4-A

KINESCOPE



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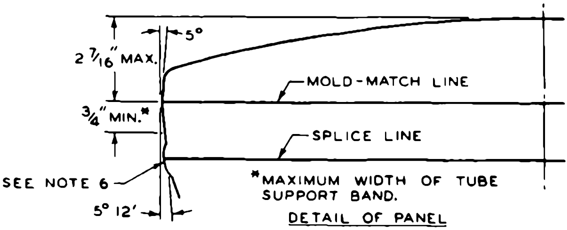
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21ALP4-A

KINESCOPE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.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 No.6.

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

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

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

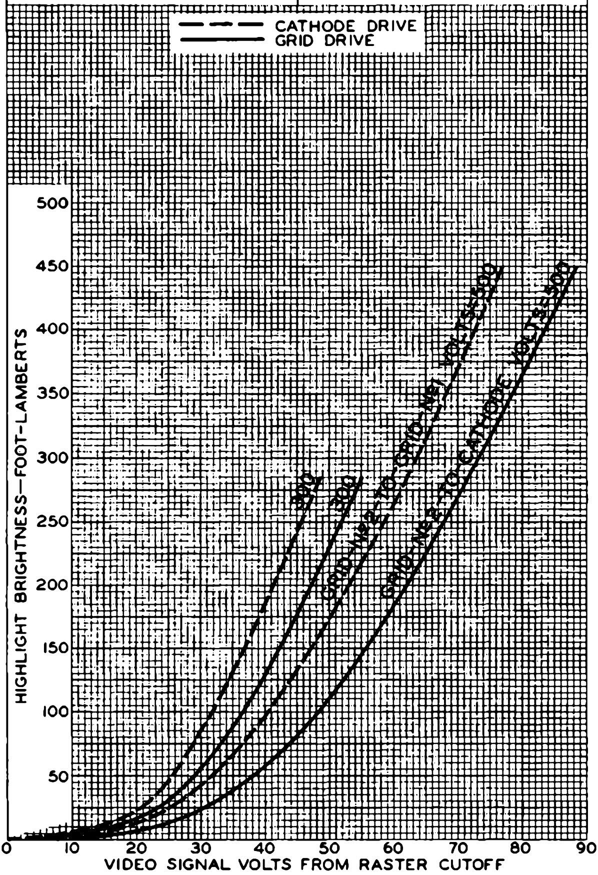
NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

RCA

21ALP4-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"

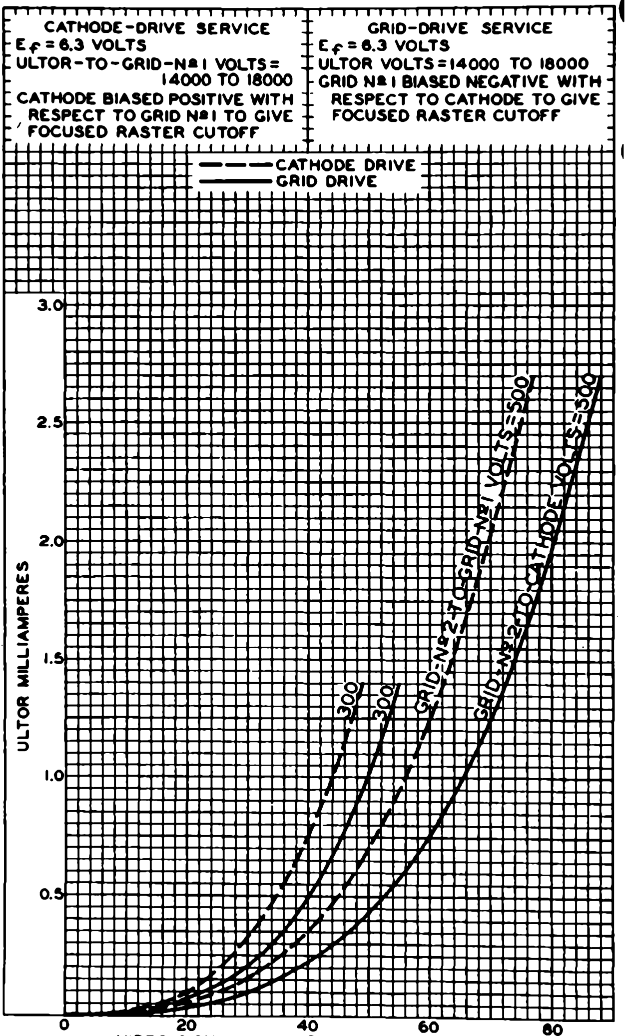


21ALP4-A

RCA

21ALP4-A

AVERAGE DRIVE CHARACTERISTICS



RCA

21ALP4-B

KINESCOPE

RECTANGULAR GLASS TYPE
LOW-VOLTAGE FOCUS

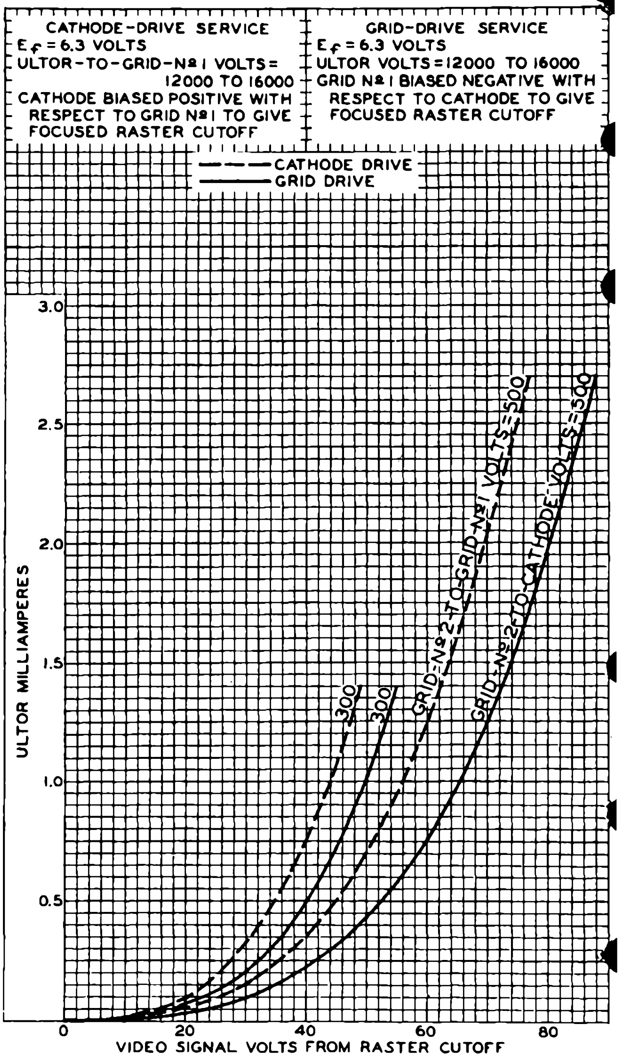
ALUMINIZED SCREEN
MAGNETIC DEFLECTION

The 21ALP4-B is the same as the 21ALP4-A except that it has a *maximum ultor voltage rating* of 20000 volts and has ULTOR CURRENT vs DRIVE curves as shown on the back of this sheet.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21ALP4-B

AVERAGE DRIVE CHARACTERISTICS



21AMP4-A
KINESCOPE

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

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. μμf; 500 min. μμf}

Faceplate, Spherical . . . . Filterglass
- Light transmission (Approx.) 75%

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

Focusing Method . . . . Magnetic
Deflection Method . . . . Magnetic

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

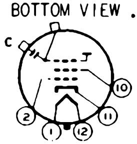
Ion-Trap Gun . . . . . . Requires External Single-Field Magnet

Tube Dimensions:
- Overall length . . . . 20" ± 3/8"
- Greatest width . . . . 20-1/4" ± 1/8"
- Greatest height . . . . 16-3/8" ± 1/8"
- Diagonal . . . . 21-3/8" ± 1/8"

Screen Dimensions (Minimum):
- Greatest width . . . . 19-1/8"
- Greatest height . . . . 15"
- Diagonal . . . . 20-1/4"
- Projected area . . . . 255 sq. in.

Weight (Approx.) . . . . 24 lbs
Mounting Position . . . . Any
Cap . . . . Recessed Small Cavity (JETEC No.J1-21)
Bulb . . . . J171 (90°)
Base . . . . Small-Shell Duodecal 5-Pin (JETEC 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

● 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 21AMP4-A, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 21AMP4-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21AMP4-A

21AMP4-A
KINESCOPE

GRID-DRIVE▲ SERVICE

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

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

Equipment Design Ranges:

With any ultor voltage (E_{c3k}) between 14000 and 18000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts*

Grid-No.1 Voltage for Visual Extinction of Focused Raster.	-9.3% to -24% of E_{c2k}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak positive)	9.3% to 24% of E_{c2k}	volts
Grid-No.2 Current	-15 to +15	µamp
Focusing-Coil Current (DC)°.	$\left[\sqrt{\frac{E_{c3k}}{16000}} \times 108\right] \pm 20\%$	ma
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c3k}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§ . . .	$\sqrt{\frac{E_{c3k}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet.	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*18000*	*volts*
and grid-No.2 voltage of	*300*	*400*	*volts*
Grid-No.1 Voltage for Visual Extinction of Focused Raster.	-28 to -72	-37 to -96	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.

21AMP4-A
KINESCOPE

Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	37 to 96	volts
Focusing-Coil Current (DC). .	108 ± 20%	115 ± 20%	ma
Minimum Field Strength of PM Ion-Trap Magnet	33	35	gausses

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	18000 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode .	180 max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_3g_1}$) between 14000 and 18000 volts*

and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 220 and 620 volts

Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	8.5% to 19.4% of $E_{c_2g_1}$	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak negative)	8.5% to 19.4% of $E_{c_2g_1}$	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.

* Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-to-grid-No.1 voltage should not be less than 14000 volts.

o, **, §: see next page.

21AMP4-A
KINESCOPE

Grid-No.2 Current	-15 to +15		μamp
Focusing-Coil Current (DC)° .	$\left[\sqrt{\frac{E_{c_3g_1}}{16000}} \times 108\right] \pm 20\%$		ma
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_3g_1}}{16000}} \times 30$		ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_3g_1}}{16000}} \times 33$		gausses
Field Strength of Adjustable Centering Magnet.	0 to 8		gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	25 to 58	34 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak negative)	25 to 58	34 to 78	volts
Focusing-Coil Current (DC). . . .	108 ± 20%	115 ± 20%	ma
Minimum Field Strength of PM Ion-Trap Magnet.	33	35	gausses

Maximum Circuit Values:

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

° For specimen focusing coil similar to JETEC Focusing Coil No. 109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line *(See Dimensional Outline)*. The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 19-1/8" x 15" picture size.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No. E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

21AMP4-A

KINESCOPE

DIMENSIONAL OUTLINE

for Type 21AMP4-A is the same as that shown for Type 21ALP4-A, except that the 21AMP4-A has a Small-Shell Duodecal 5-Pin Base

CURVES

for Type 21AMP4-A are the same as those shown for Type 21ALP4-A

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21AP4

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21AP4
KINESCOPE

RECTANGULAR METAL-SHELL TYPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

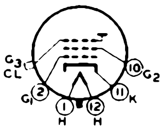
DATA

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	6	μμf
Cathode to All Other Electrodes	5	μμf
Faceplate (With about 66% light transmission)		Frosted Filterglass
Phosphor (For Curves, see front of this Section)		No.4—Sulfide Type
Fluorescence and Phosphorescence		White
Persistence of Phosphorescence		Short
Focusing Method		Magnetic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		70°
Horizontal		66°
Vertical		50°
Ion-Trap Gun		Requires External, Single-Field Magnet
Maximum Overall Length		22-5/16"
Greatest Diagonal of Tube at Lip		20-3/4" ± 1/4"
Greatest Width of Tube at Lip		19-23/32" ± 1/8"
Greatest Height of Tube at Lip		15-5/16" ± 1/8"
Screen Size		18-3/8" x 13-15/16"
Mounting Position		Any
Ultor● Terminal		Metal-Shell Lip
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
Metal - Shell Lip— 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

● In the 21AP4, 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.

21AP4

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
Typical Operation:			
Ultor Voltage*	14000	16000	volts
Grid-No.2 Voltage.	300	300	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	-33 to -77	-33 to -77	volts
Focusing-Coil Current (DC)°° .	104 ±6%	110 ±6%	ma
Field Strength of Single-Field Ion-Trap Magnet . . .	45	50	gausses
Ion-Trap Magnet Current (DC, approx.)#.	90	-	ma
Field Strength of Adjustable Centering Magnet. . . .	0 to 8	0 to 8	gausses
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 14000 volts.

°° For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (see Outline Drawing). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 18-3/8" x 13-15/16" picture area sharply focused at center of screen.

\# For specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No.111 located in optimum position and rotated to give maximum brightness.

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21AP4

KINESCOPE

OPERATING NOTES

X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, the 21AP4 does not produce any harmful x-ray radiation. However, because the rating of the tube permits operation at voltages as high as 19.8 kilovolts (absolute value), shielding of the 21AP4 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.

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

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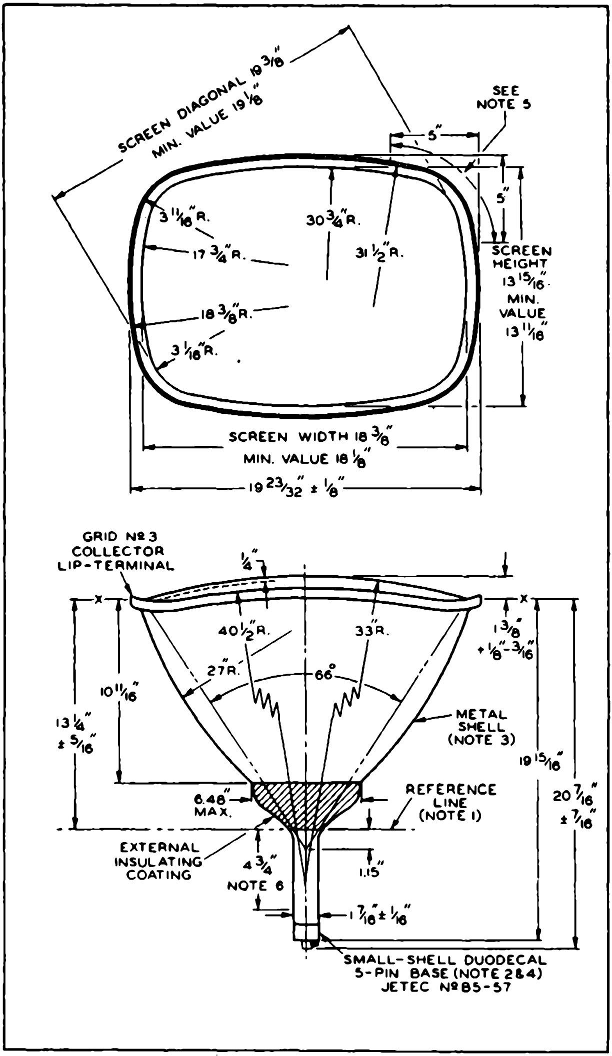
21AP4
KINESCOPE



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21AP4

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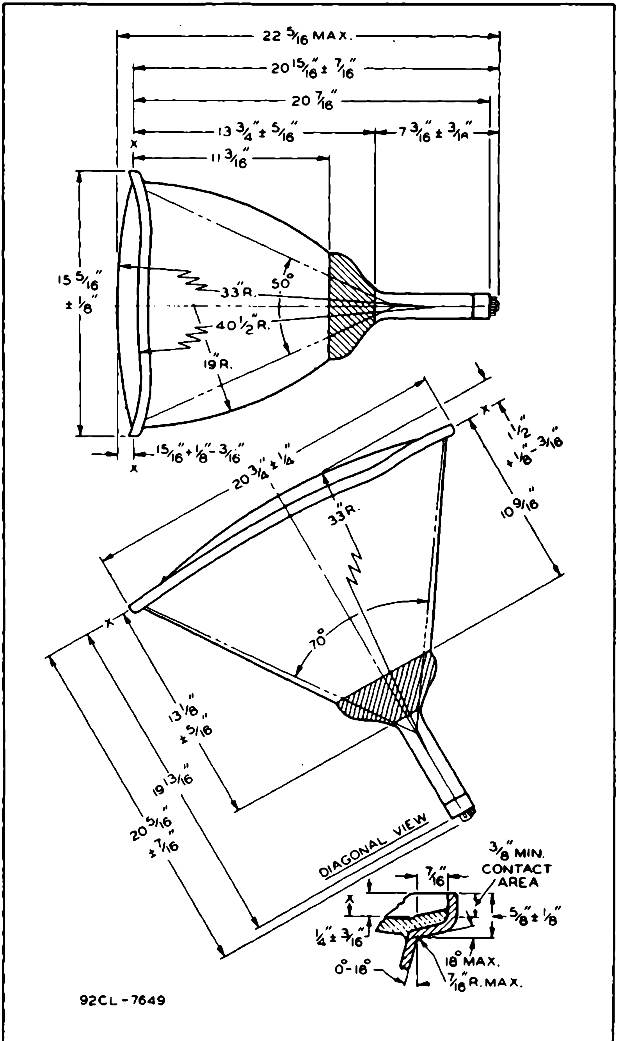

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21AP4

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NOTE 1: 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 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 3-1/4".

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.

NOTE 4: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE HORIZONTAL AXIS OF THE GLASS FACE BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm$ 10°.

NOTE 5: SUPPORT TUBE IN LIP REGION ONLY AT CORNERS WITHIN THIS SPACE.

NOTE 6: LOCATION OF DEFLECTING YOKE AND FOCUSING DEVICE MUST BE WITHIN THIS SPACE.

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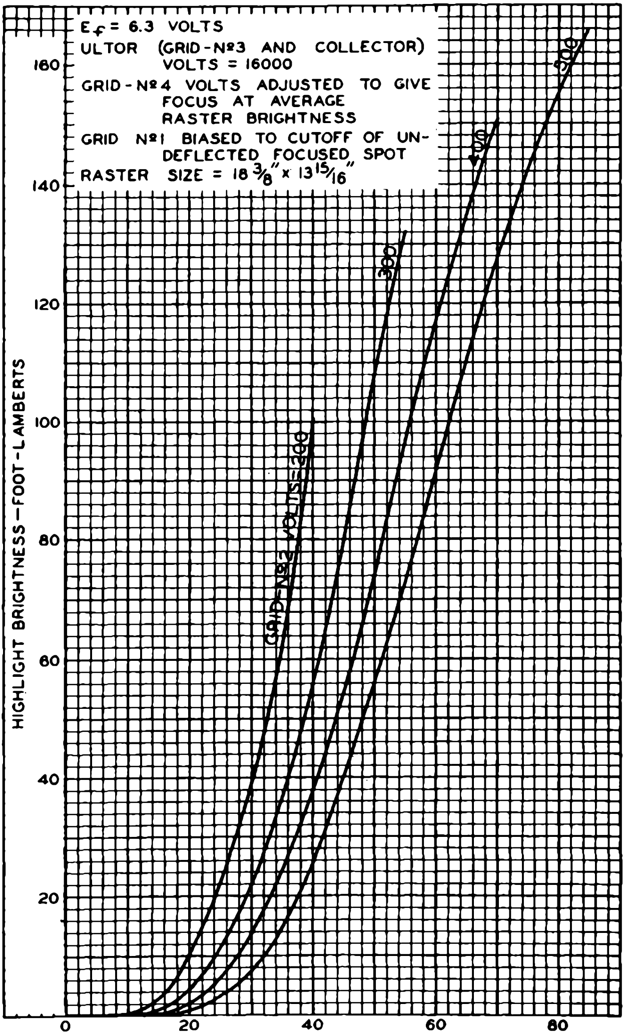
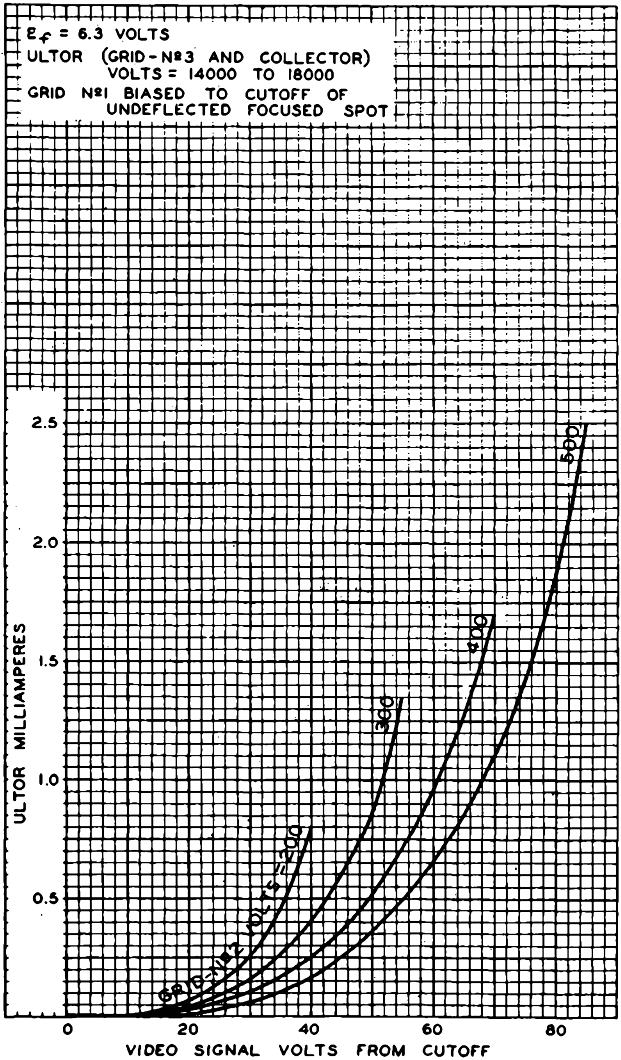
21AP4

AVERAGE GRID-DRIVE CHARACTERISTICS



21AP4

AVERAGE GRID-DRIVE CHARACTERISTICS



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92CM-7652

21ATP4
KINESCOPE

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

The 21ATP4 is the same as the 21ALP4-A except for the following items:

Direct Interelectrode Capacitances:

External conductive coating to ultor . .	1500 max.	$\mu\mu$f
	1200 min.	$\mu\mu$f

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21AVP4/21AUP4
KINESCOPE

RECTANGULAR GLASS TYPE

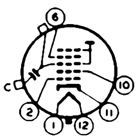
LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp
Direct Interelectrode Capacitances:		
Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor●	1500 max. / 1200 min.	μμf
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		71%
Phosphor (For curves, see front of this Section)		P4—Sulfide Type
Fluorescence		White
Phosphorescence		White
Persistence		Short
Focusing Method		Electrostatic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		72°
Horizontal		67°
Vertical		53°
Ion-Trap Gun		Requires 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"
Screen Dimensions (Minimum):		
Greatest width		19-1/8"
Greatest height		15"
Diagonal		20-1/4"
Projected area		255 sq. in.
Weight (Approx.)		24 lbs
Mounting Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Bulb		J171 (72°)
Base		Small-Shell Duodecal 6-Pin (JETEC No.B6-63)
Basing Designation for BOTTOM VIEW		12L

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



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

●: See next page.

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21AVP4

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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	18000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value*	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	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

Equipment Design Ranges:

With any ultor voltage (E_{c_5k}) between 14000# and 18000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp	-0.4% to +2.2% of E_{c_5k}	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of E_{c_2k}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	9.3% to 24% of E_{c_2k}	volts
Grid-No.4 Current	-25 to +25	μamp
Grid-No.2 Current	-15 to +15	μamp
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_5k}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_5k}}{16000}} \times 33$	gausses
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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Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*18000*	*volts*
and grid-No.2 voltage of	*300*	*400*	*volts*
Grid-No.4 Voltage for Focus with Ultor Current of 100 µamp . . .	-65 to +350	-75 to +400	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster.	-28 to -72	-37 to -96	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	37 to 96	volts
Minimum Field Strength of PM Ion-Trap Magnet. . . .	33	35	gausses

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR●-TO-GRID-No.1 VOLTAGE	18000 max.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value.	1000 max.	volts
Negative value*	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 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

● 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 21AVP4, the ultor function is performed by grid No.5. Since grid No.5, grid No.3, and collector are connected together within the 21AVP4, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

* This value has been specified to take care of the condition where an ac voltage is provided for dynamic focusing.

■ 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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Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) between 14000# and 18000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 220 and 620 volts

Grid-No.4-to-Grid-No.1 Voltage for Focus with Ultor Current of 100 μamp	0% to 2.6% of $E_{c_5g_1}$	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	8.5% to 19.4% of $E_{c_2g_1}$	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	8.5% to 19.4% of $E_{c_2g_1}$	volts
Grid-No.4 Current	-25 to +25	μamp
Grid-No.2 Current	-15 to +15	μamp
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_5g_1}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_5g_1}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet.	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Grid-No.4-to Grid-No.1 Voltage for Focus with Ultor Current of 100 μamp	0 to 415	0 to 470	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	25 to 58	34 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	25 to 58	34 to 78	volts
Minimum Field Strength of PM Ion-Trap Magnet.	33	35	gausses

Maximum Circuit Values:

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

#,**,§: See next page.

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21AVP4

KINESCOPE

Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 14000 volts.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

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21AVP4

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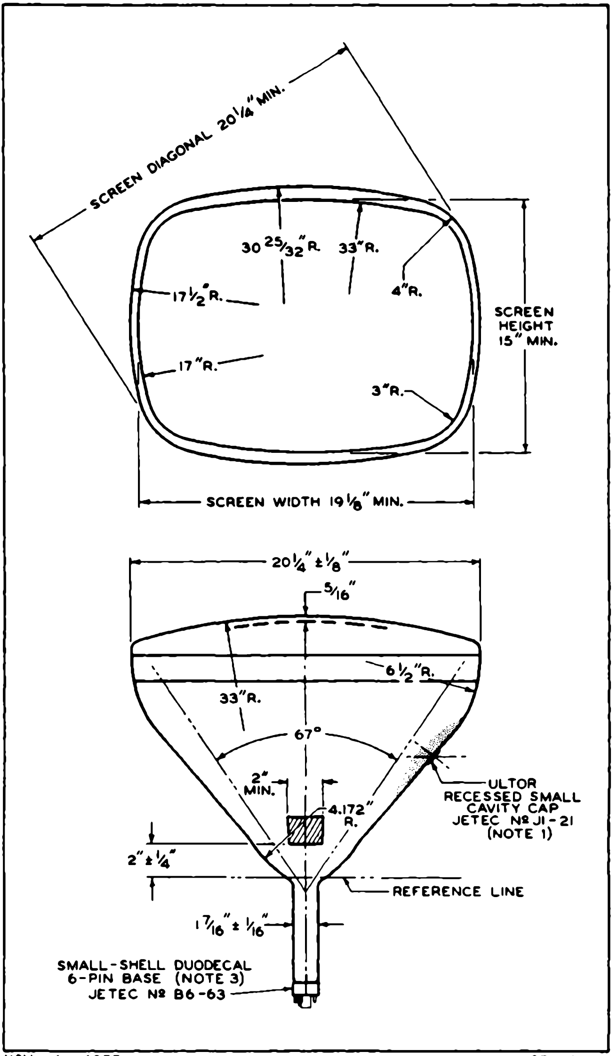

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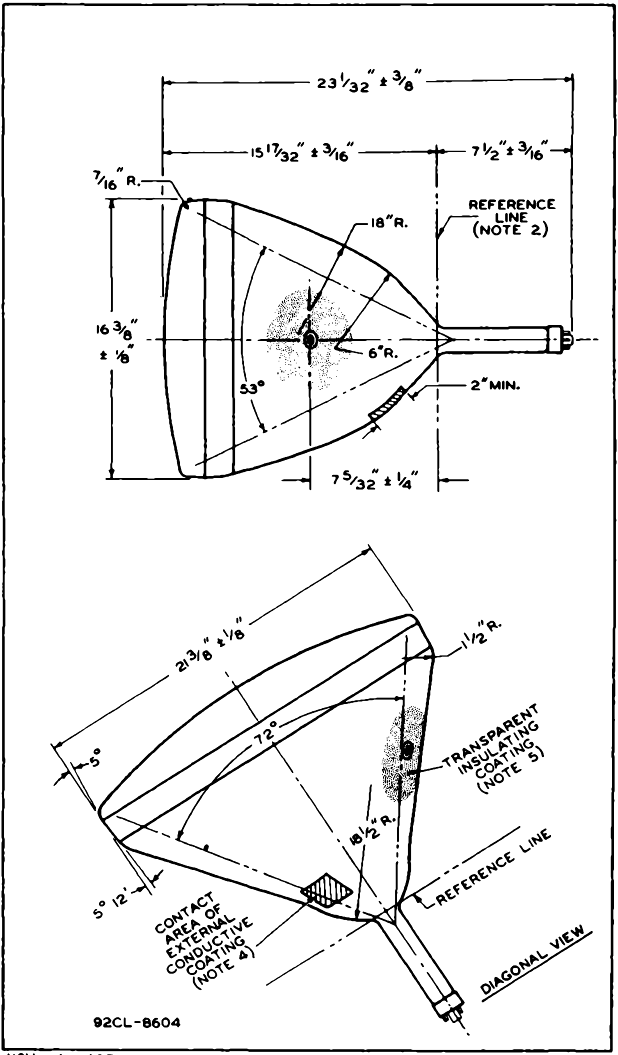

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21AVP4

21AVP4

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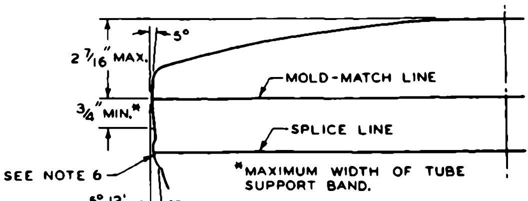

DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.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 No.6.

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

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

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

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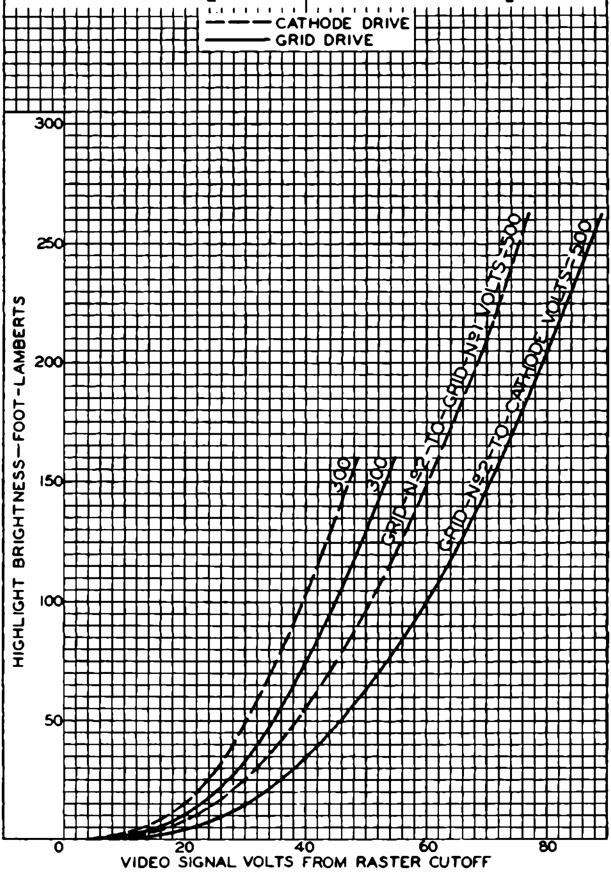
21AVP4

21AVP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID №1 TO GIVE FOCUSED RASTER CUTOFF	GRID №1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF
RASTER FOCUSED AT AVERAGE BRIGHTNESS	RASTER FOCUSED AT AVERAGE BRIGHTNESS
RASTER SIZE = 18" x 13 1/2"	RASTER SIZE = 18" x 13 1/2"



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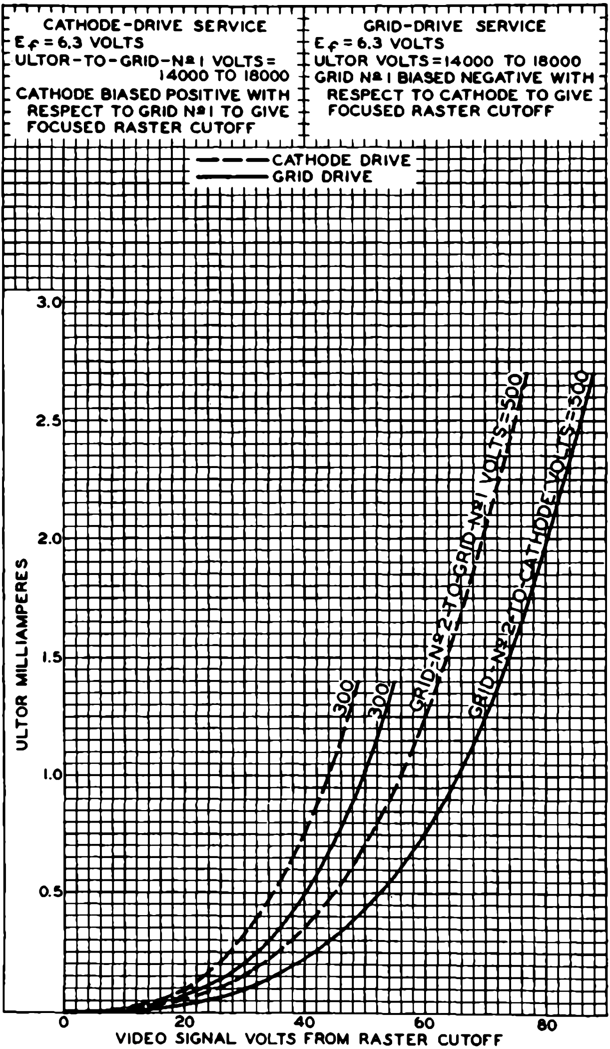
21AVP4

21AVP4

AVERAGE DRIVE CHARACTERISTICS



NOV. 2, 1955

TUBE DIVISION
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92CM-8839

21AVP4-A/21AUP4-A

KINESCOPE

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

The 21AVP4-A/21AUP4-A is the same as the 21AVP4/21AUP4 except for the following item:

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

CURVES

for Type 21AVP4-A/21AUP4-A are the same as those shown for Type 21ALP4-A

21AWP4
KINESCOPE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

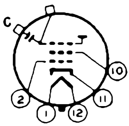
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp

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.) . . . 71%
Phosphor (For curves, see front of this Section) . . P4—Sulfide Type Aluminized
  Fluorescence . . . White
  Phosphorescence . . . White
    Persistence . . . Short
Focusing Method . . . Magnetic
Deflection Method . . . Magnetic
Deflection Angles (Approx.):
  Diagonal . . . 72°
  Horizontal . . . 67°
  Vertical . . . 53°
Ion-Trap Gun . . . Requires 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"
Screen Dimensions (Minimum):
  Greatest width . . . 19-1/8"
  Greatest height . . . 15"
  Diagonal . . . 20-1/4"
  Projected area . . . 255 sq. in.
Weight (Approx.) . . . 24 lbs
Mounting Position . . . Any
Cap . . . Recessed Small Cavity (JETEC No.J1-21)
Bulb . . . J171 (72°)
Base . . . Small-Shell Duodecal 5-Pin (JETEC 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

● 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 21AWP4, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 21AWP4, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

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21AWP4

21AWP4
KINESCOPE

GRID-DRIVE▲ SERVICE

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

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

Equipment Design Ranges:

With any ultor voltage (E_{c_3k}) between 14000 and 18000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts*

Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of E_{c_2k}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak positive)	9.3% to 24% of E_{c_2k}	volts
Grid-No.2 Current.	-15 to +15	µamp
Focusing-Coil Current (DC)°.	$\left[\sqrt{\frac{E_{c_3k}}{16000}} \times 108\right] \pm 20\%$	ma
Ion-Trap Magnet Current (Average)**.	$\sqrt{\frac{E_{c_3k}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§. . . .	$\sqrt{\frac{E_{c_3k}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*18000*	*volts*
and grid-No.2 voltage of	*300*	*400*	*volts*
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-37 to -96	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 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	37 to 96	volts
Focusing-Coil Current (DC). .	108 ± 20%	115 ± 20%	ma
Minimum Field Strength of PM Ion-Trap Magnet.	33	35	gausses

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE.	18000 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	410 max.	volts
After equipment warm-up period.	180 max.	volts
Heater positive with respect to cathode .	180 max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_3g_1}$) between 14000 and 18000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 220 and 620 volts*

Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	8.5% to 19.4% of $E_{c_2g_1}$	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak negative)	8.5% to 19.4% of $E_{c_2g_1}$	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.

* Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-to-grid-No.1 voltage should not be less than 14000 volts.

o,**,§: See next page.

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Grid-No.2 Current	-15 to +15		μamp
Focusing-Coil Current (DC)° .	$\left[\sqrt{\frac{E_{c_2 g_1}}{16000}} \times 108\right] \pm 20\%$		ma
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_2 g_1}}{16000}} \times 30$		ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_2 g_1}}{16000}} \times 33$		gausses
Field Strength of Adjustable Centering Magnet.	0 to 8		gausses
Examples of Use of Design Ranges:			
With ultor-to-grid-No.1 voltage of	*16000*	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	25 to 58	34 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak negative)	25 to 58	34 to 78	volts
Focusing-Coil Current (DC). . . .	108 ± 20%	115 ± 20%	ma
Minimum Field Strength of PM Ion-Trap Magnet.	33	35	gausses
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance.		1.5 max.	megohms

° For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line *(See Dimensional Outline)*. The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 19-1/8" x 15" picture size.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

21AWP4

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DIMENSIONAL OUTLINE

for Type 21AWP4 is the same as that shown for Type 21AVP4/21AUP4, except that the 21AWP4 has a Small-Shell Duodecal 5-Pin Base

CURVES

for Type 21AWP4 are the same as those shown for Type 21ALP4-A

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21AXP22
COLOR KINESCOPE

THREE-GUN SHADOW-MASK TYPE — 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	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		Metal-Backed, Tricolor, Phosphor-Dot
Phosphor (Three separate phosphors, collectively)		P22
Fluorescence and phosphorescence of separate phosphors, respectively		Blue, Green, Red
Persistence of group phosphorescence		Medium
Dot arrangement		Triangular group consisting of blue dot, green dot, and red dot
Spacing between centers of adjacent dot trios (Approx.)		0.029"
Size (Minimum):		
Greatest width		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		21-1/4" max.
Weight (Approx.)		28 lbs
Mounting Position		Any
Ultor● Terminal		Metal-Shell Lip
Base		Small-Shell Neodiheptal 12-Pin (JETEC No.B12-131)

●: See next page.

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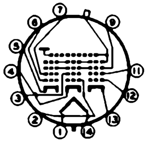
Socket . . . . .Alden Nos.214NMINSC (Radial leads), 214NMINC (Axial leads), or equivalent

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 LIP: 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:

For ultor voltage ($E_{c_4}k$ each gun) of 25000 volts

Grid-No.3 (Focusing electrode)-to-Cathode (Of each gun) Voltage.	15.2% to 21.2% of $E_{c_4}k_{\text{each gun}}$	volts
Grid-No.2-to-Cathode Voltage (Each gun) when circuit design utilizes grid-No.1-to-cathode voltage ($E_{c_1}k$) at fixed value for raster cutoff	*See Cutoff Design Chart*	

* A value of average ultor current per gun higher than 500 microamperes will increase picture brightness but may impair resolution and shorten cathode life.

●: See next page.

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Grid-No.1-to-Cathode Voltage (Each gun) for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2-to-cathode voltage (E_{c2k}) at fixed value	*See Cutoff Design Chart*	
Variation in Raster Cutoff Between Guns in Any Tube.	± 21% of average of highest and lowest cutoff values	
Grid-No.3 Current 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 + 27M.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
Maximum Compensation to be Provided by the Following Components:		
Purifying coil or magnet	Raster shift of 1" in any direction from screen center	
Converging component (Each gun):		
For static convergence—		
After adjustment has been made for optimum color purity and dynamic convergence	Shift of spot by ± 5/8"	

● 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 21AXP22, the ultor function is performed by grid No.4. Since grid No.4, grid No.5, and collector are connected together within the 21AXP22, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

□ 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.

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For dynamic convergence†—

Effected by mmf of approximately parabolic waveshape synchronized with scanning

Horizontal:

Red spot and green spot	Shift of 1/4"
Blue spot	Shift of 1/2"

Vertical:

Red spot and green spot	Shift of 3/8"
Blue spot	Shift of 1/8"

Blue-positioning magnet (Blue gun):

After adjustment has been made for color purity and dynamic convergence	Shift of blue spot by ± 1/2"

Examples of Use of Design Ranges:

	For ultor voltage of 25000 volts	
Grid-No.3 (Focusing electrode)-to-Cathode (Of each gun) Voltage	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	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	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 the ultor power supply output capacitor and the ultor, and the effective resistance between grid-No.3 power supply output capacitor and the grid-No.3 electrode should not be less than 50000 ohms. These resistances should be capable of withstanding the maximum instantaneous currents and voltages in their

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

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respective circuits. It is to be noted that the effectiveness of the resistance between the ultor power supply output capacitor and the ultor may be impaired if capacitance in excess of 750 $\mu\mu$f is introduced between the kinescope and ground by the mounting arrangement of the kinescope.

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

Low-Voltage Circuits:

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

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

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

X-RAY WARNING

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

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

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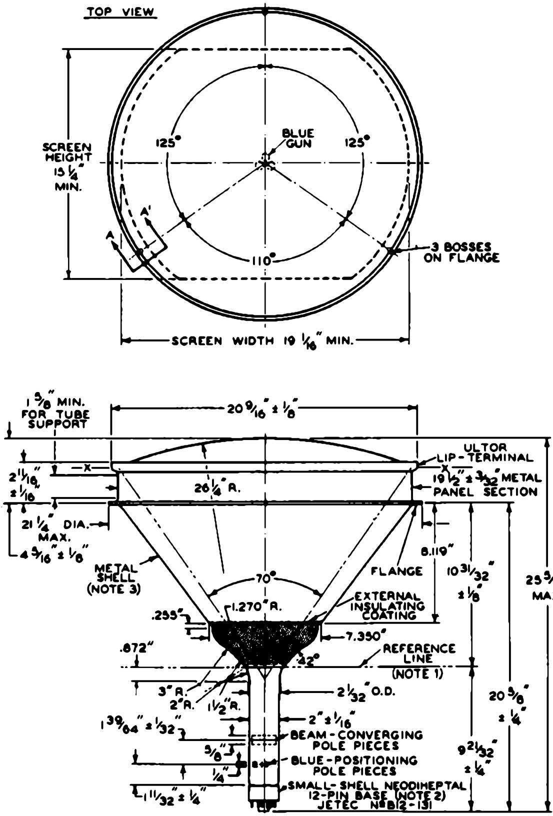

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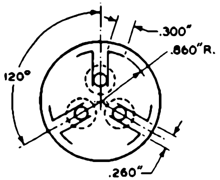
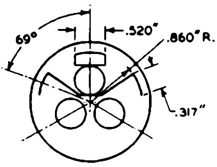
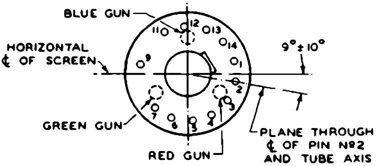


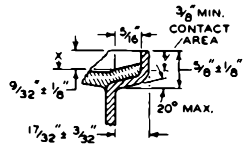
LOCATION OF BEAM-CONVERGING POLE PIECES



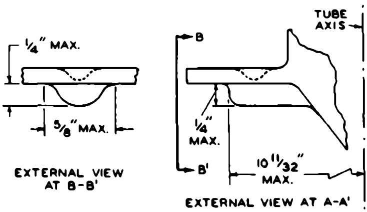
LOCATION OF BLUE-POSITIONING POLE PIECES



BASE
BOTTOM VIEW



DETAIL OF LIP



DETAIL OF FLANGE BOSSES

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MAR. 1, 1955

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NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE A CYLINDRICAL GAUGE 2.465" ± 0.001" I.D. CONCENTRIC WITH NECK AXIS, WILL REST ON ENVELOPE FUNNEL.

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

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

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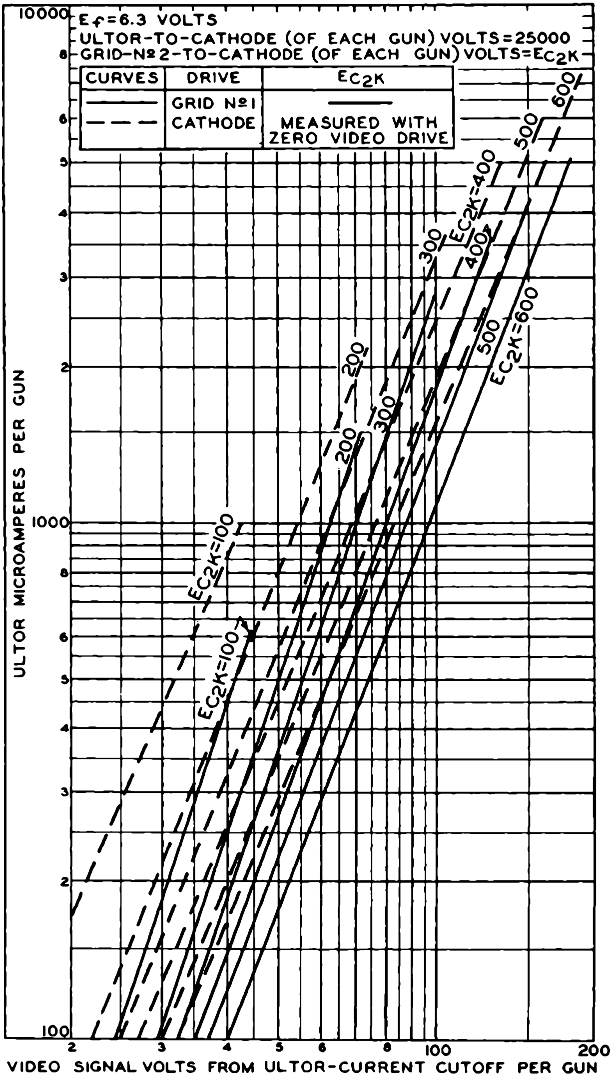
TYPICAL DRIVE CHARACTERISTICS



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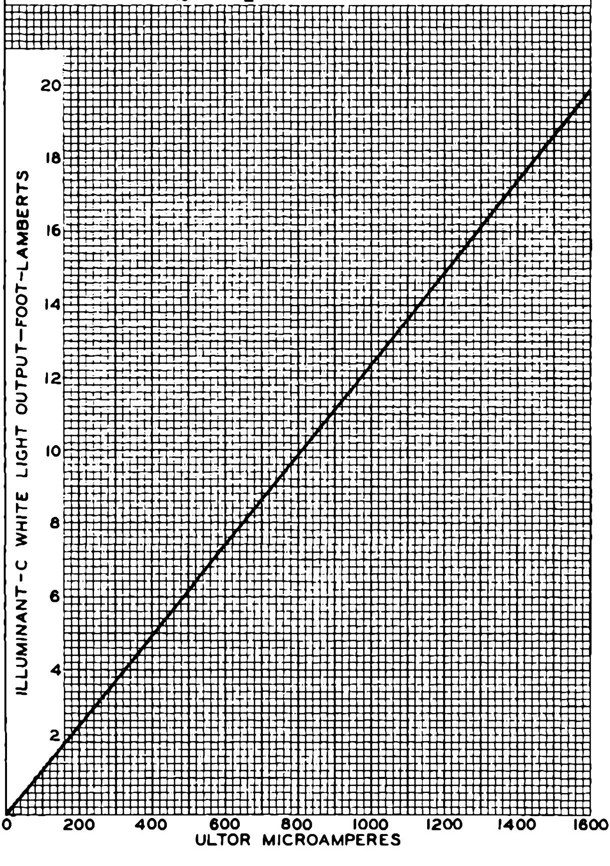
TYPICAL LIGHT–OUTPUT CHARACTERISTIC

E_f=6.3 VOLTS
ULTOR-TO-CATHODE (OF EACH GUN) VOLTS=25000
GRID-№3-TO-CATHODE (OF EACH GUN) VOLTS=ADJUSTED FOR FOCUS
DRIVE OF EACH GUN IS ADJUSTED TO GIVE COMPOSITE ULTOR CURRENT TO PRODUCE ILLUMINANT-C WHITE LIGHT OUTPUT
PERCENTAGE OF TOTAL ULTOR CURRENT SUPPLIED BY EACH GUN TO PRODUCE ILLUMINANT-C WHITE:

RED GUN: 57 %
BLUE GUN: 17 %
GREEN GUN: 26 %

RASTER SIZE = 19 1/16" x 14 1/2"



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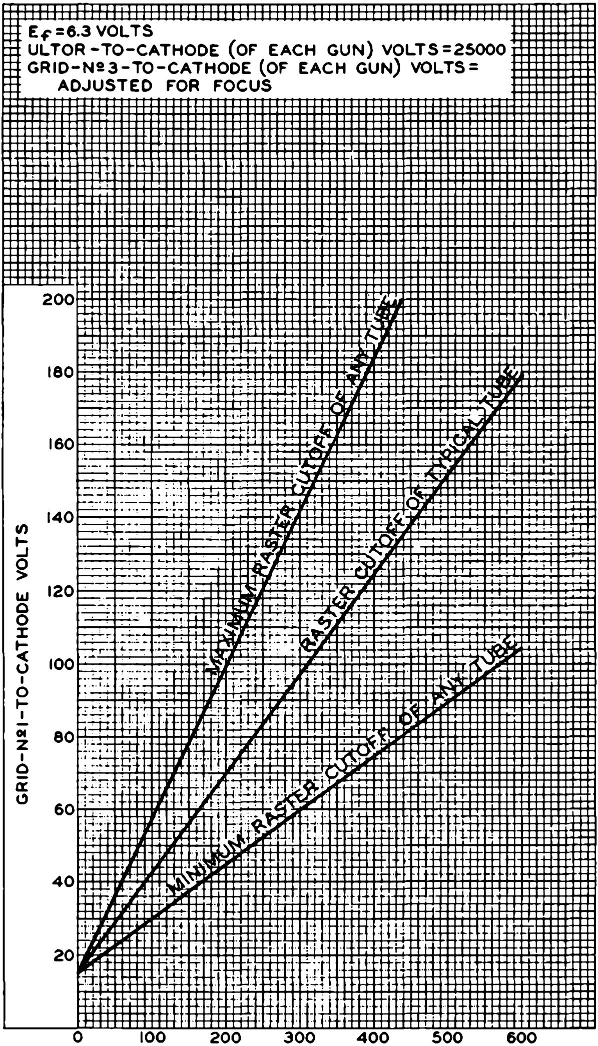
CUTOFF DESIGN CHART



21CXP4
PICTURE TUBE

RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION
LOW GRID-No.2 VOLTAGE — CATHODE-DRIVE TYPE

With heater having controlled warm-up time

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . 6.3 . . . . . . ac or dc volts
- Current . . . . 0.6 ± 10% . . . . amp
- Warm-up time (Average) . 11 . . . . sec

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

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . . 6 μμf
- Cathode to all other electrodes . . . . 5 μμf
- External conductive coating to ultor . . . . {2500 max. μμf; 2000 min. μμf}

Faceplate, Spherical . . . . Filterglass
- Light transmission (Approx.) 74%

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

Focusing Method . . . . Electrostatic

Deflection Method . . . . Magnetic

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

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

Tube Dimensions:
- Overall length . . . . 18" ± 3/8"
- Greatest width . . . . 20-1/4" ± 1/8"
- Greatest height . . . . 16-3/8" ± 1/8"
- Diagonal . . . . 21-3/8" ± 1/8"
- Neck length . . . . 5-1/2" ± 3/16"
- Radius of curvature of faceplate (External surface) . . 33"

Screen Dimensions (Minimum):
- Greatest width . . . . 19-1/16"
- Greatest height . . . . 15-1/16"
- Diagonal . . . . 20-1/4"
- Projected area . . . . 262 sq. in.

Weight (Approx.) . . . . 24 lbs

Operating Position . . . . Any

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

Bulb J171D2/E1

Base . . . . Small-Shell Duodecal 6-Pin, Arrangement 1 (JEDEC Group 4, No.B6-63), or Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203)

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

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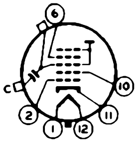
21CXP4

PICTURE TUBE

Basing Designation for BOTTOM VIEW 12L

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



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

CATHODE-DRIVE■ SERVICE

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

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

ULTOR-TO-GRID-No.1 VOLTAGE	20000	max.	volts
	12000●	min.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:			
Positive value	1000	max.	volts
Negative value	500	max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	64	max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:			
Positive-peak value.	200	max.	volts
Positive-bias value.	140	max.	volts
Negative-bias value.	0	max.	volts
Negative-peak value.	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds	410	max.	volts
After equipment warm-up period . .	180	max.	volts
Heater positive with respect to cathode	180	max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) between 12000 and 20000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 40 and 64 volts

Grid-No.4-to-Grid-No.1 Voltage for focus§ . . . . 0 to 350 volts

Cathode-to-Grid-No.1 Voltage (E_{kg_1}) for visual extinction of focused raster▲ . . . .*See Raster-Cutoff-Range Chart*

Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):
White-level value (Peak negative). . . . . Same value as determined for E_{kg_1} except video drive is a negative voltage

■,●,§,▲: See next page.

21CXP4

PICTURE TUBE

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

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*18000*	***volts***
and grid-No.2-to-grid-No.1 voltage of	*50*	***volts***
Grid-No.4-to-Grid-No.1 Voltage for focus.	0 to 350	volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster.	32 to 47	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value.	-32 to -47	volts

Maximum Circuit Values:

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

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

● This value is a working design-center minimum. The equivalent ***absolute minimum*** ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 21CXP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor-to-grid-No.1 voltage is never less than 11,000 volts.

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

▲ The cathode-to-grid-No.1 voltage (E_{kg_1}) will increase by approximately 2 per cent for every 1000-volt increase in ultor-to-grid-No.1 voltage and will decrease by approximately 2 per cent for every 1000-volt decrease in ultor-to-grid-No.1 voltage.

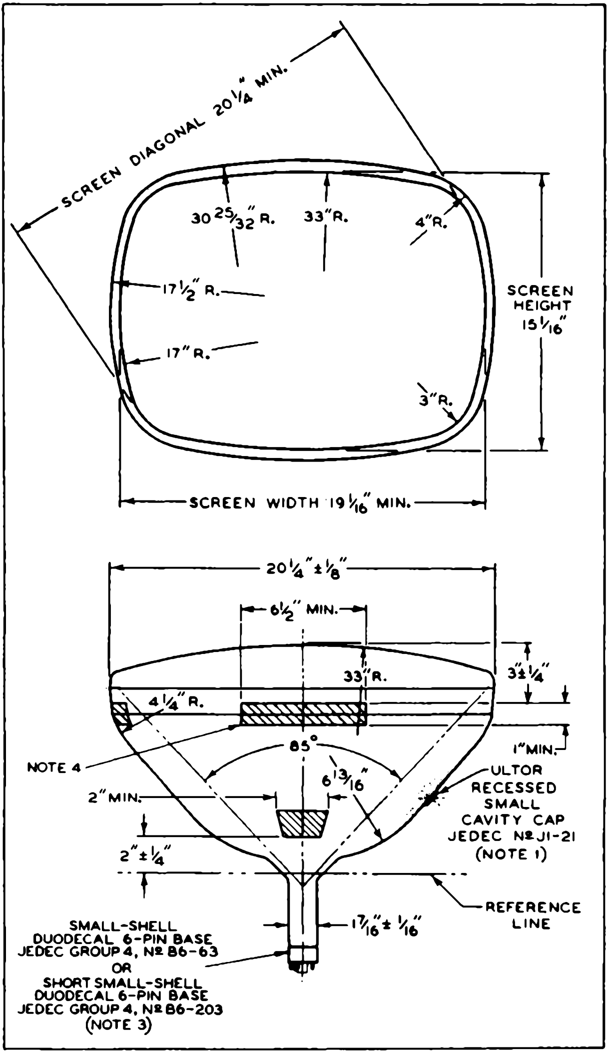
* Distance from ***Reference Line*** for suitable PM centering magnet should not exceed 2-1/2". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

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

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

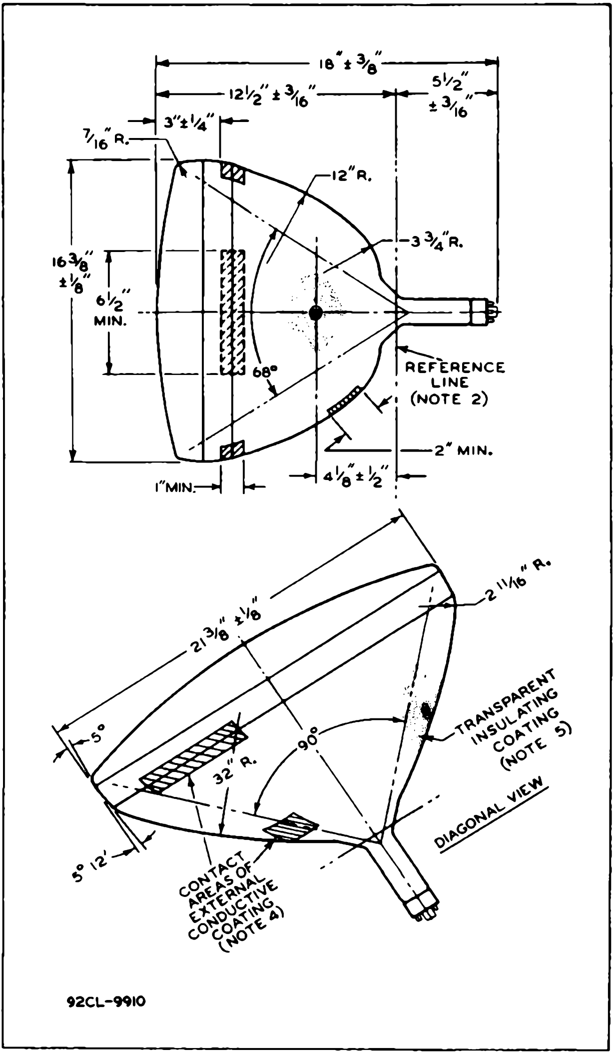
21CXP4

PICTURE TUBE



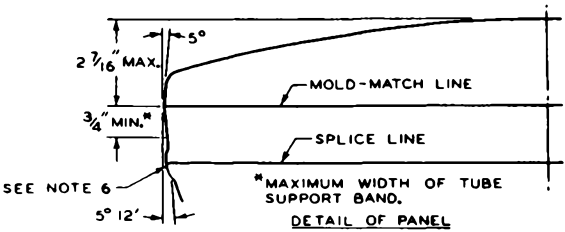
RCA

21CXP4
PICTURE TUBE



21CXP4

PICTURE TUBE



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

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

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THREE OF FOUR CONTACT AREAS OF THE EXTERNAL CONDUCTIVE COATING. IN ADDITION TO THE 2" x 2" MIN. CONTACT AREA SHOWN, A 6-1/2" x 1" MIN. CONTACT AREA IS PROVIDED IN THE VICINITY OF THE SPLICE LINE ON EACH LONG SIDE OF THE BULB AND ON AT LEAST ONE SHORT SIDE OF THE BULB AS SHOWN. THE ACTUAL AREA OF EXTERNAL CONDUCTIVE COATING WHICH CONNECTS ALL THE CONTACT AREAS WILL BE GREATER THAN THE CONTACT AREAS SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

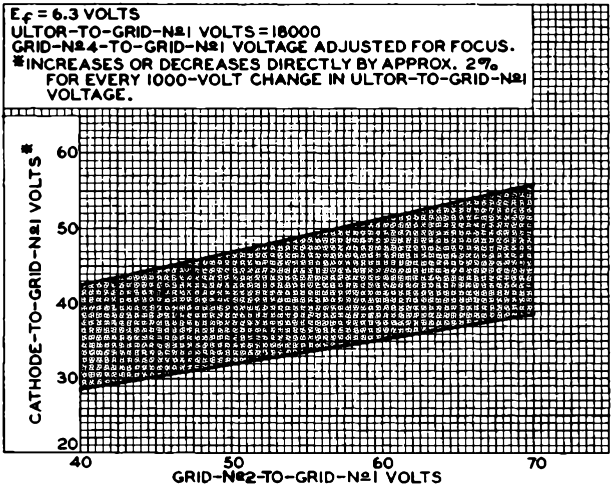
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

RCA

21CXP4

RASTER-CUTOFF-RANGE CHART

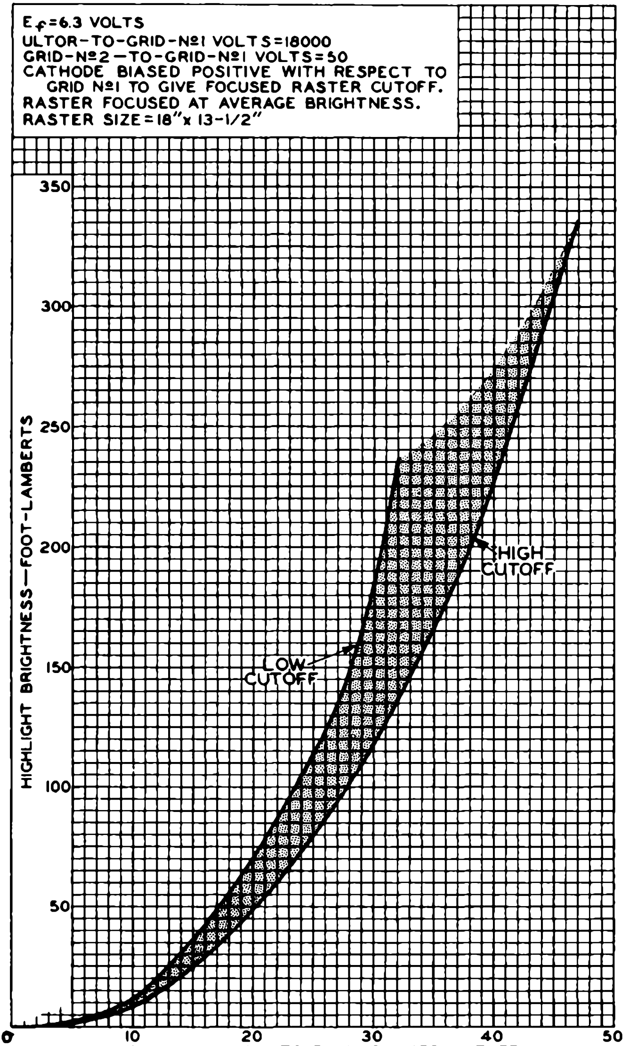


92CS-9911

21CXP4

21CXP4

CATHODE-DRIVE CHARACTERISTICS



ELECTRON TUBE DIVISION 92CM-9904

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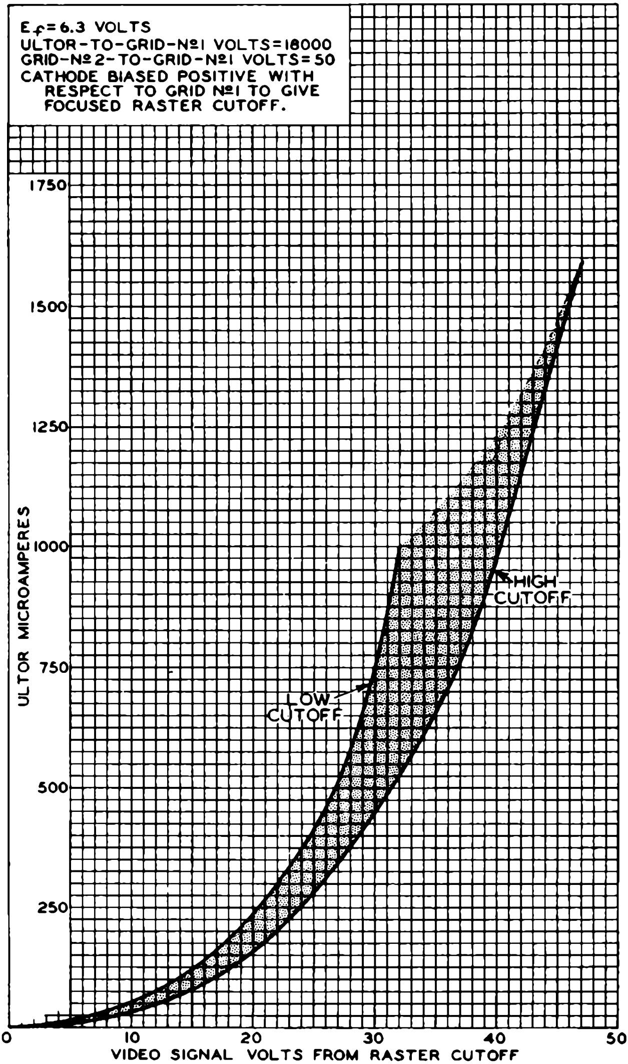
21CXP4

CATHODE-DRIVE CHARACTERISTICS



21DAP4
PICTURE TUBE

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

Intended for use in equipment having series heater-string arrangement

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6	amp
Warm-up time (Average)	11	sec

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

Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor	2500 max.	μμf
	2000 min.	μμf

Faceplate, Spherical	Filterglass
Light transmission (Approx.)	74%
Phosphor (For Curves, see front of this Section)	P4—Sulfide Type Aluminized
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	110°
Horizontal	105°
Vertical	87°
Electron Gun	Type Requiring No Ion-Trap Magnet
Tube Dimensions:	
Overall length	14-11/16" ± 5/16"
Greatest width	20-1/4" ± 1/8"
Greatest height	16-3/8" ± 1/8"
Diagonal	21-3/8" ± 1/8"
Neck length	5-7/16" ± 1/8"
Screen Dimensions (Minimum):	
Greatest width	19-1/16"
Greatest height	15-1/16"
Diagonal	20-1/4"
Projected area	262 sq. in.
Weight (Approx.)	20 lbs
Operating Position	Any
Cap	Recessed Small Cavity (JEDEC No.J1-21)
Bulb	J171G1/K1

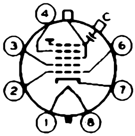
21DAP4

21DAP4

PICTURE TUBE

Base	Small-Button Eightar 7-Pin, Arrangement 2, (JETEC No.B7-183)
Basing Designation for BOTTOM VIEW.	8HR

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



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

GRID-DRIVE▲ SERVICE

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

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

ULTOR VOLTAGE	18000	max.	volts
	12000◆	min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:			
Positive value.	1000	max.	volts
Negative value.	500	max.	volts
GRID-No.2 VOLTAGE	500	max.	volts
GRID-No.1 VOLTAGE:			
Negative-peak value	200	max.	volts
Negative-bias value	140	max.	volts
Positive-bias value	0	max.	volts
Positive-peak value	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds.	410	max.	volts
After equipment warm-up period. . . .	180	max.	volts
Heater positive with respect to cathode.	180	max.	volts

Equipment Design Ranges:

With any ultor voltage (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	

▲,◆,§: See next page.

21EP4-A

RCA

21EP4-A
KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unpotential Cathode:

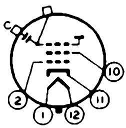
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp

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.	μμf
	500 min.	μμf

Faceplate, Cylindrical	Filterglass
Light transmission (Approx.)	71%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	70°
Horizontal	65°
Vertical	50°
Ion-Trap Gun	Requires External Single-Field Magnet
Tube Dimensions:	
Overall length	23" ± 3/8"
Greatest width	20-1/4" ± 1/8"
Greatest height	15-9/16" ± 1/8"
Diagonal	21-7/32" ± 1/8"
Screen Dimensions (Minimum):	
Greatest width	19-1/8"
Greatest height	13-7/8"
Diagonal	20-1/16"
Projected area	238 sq. in.
Weight (Approx.)	29 lbs
Mounting Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Bulb	J170
Base	Small-Shell Duodecal 5-Pin (JETEC 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

● 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 21EP4-A, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 21EP4-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

← Indicates a change.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21EP4-A

KINESCOPE

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

Equipment Design Ranges:

For any ultor voltage (E_{c_3}) between 14000# and 18000 volts and grid-No.2 voltage (E_{c_2}) between 200 and 500 volts

Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of E_{c_2}	volts
Grid-No.2 Current	-15 to +15	µamp
Focusing-Coil Current (DC)°° .	$\left[\sqrt{\frac{E_{c_3}}{16000}} \times 110\right] \pm 20\%$	ma
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_3}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_3}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

For ultor voltage of	*14000*	*16000*	*volts*
and grid-No.2 voltage of	*300*	*300*	*volts*
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-28 to -72	volts
Focusing-Coil Current (DC) . .	103 ± 20%	110 ± 20%	ma
Minimum Field Strength of PM Ion-Trap Magnet	31	33	gausses

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 14000 volts.

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

°°,§: See next page.

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21EP4-A

KINESCOPE

∞ For specimen focusing coil similar to JETEC Focusing Coil No. 109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line *(See Dimensional Outline)*. The indicated current is for condition with sharp focus at center of picture area and combined grid-No. 1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 19-1/8" x 13-7/8" picture size.

§ For specimen PM ion-trap magnet, such as Heppner Model No. E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

AVERAGE GRID-DRIVE CHARACTERISTICS
for Type 21EP4-A are the same as those shown for Type 21AVP4/21AUP4

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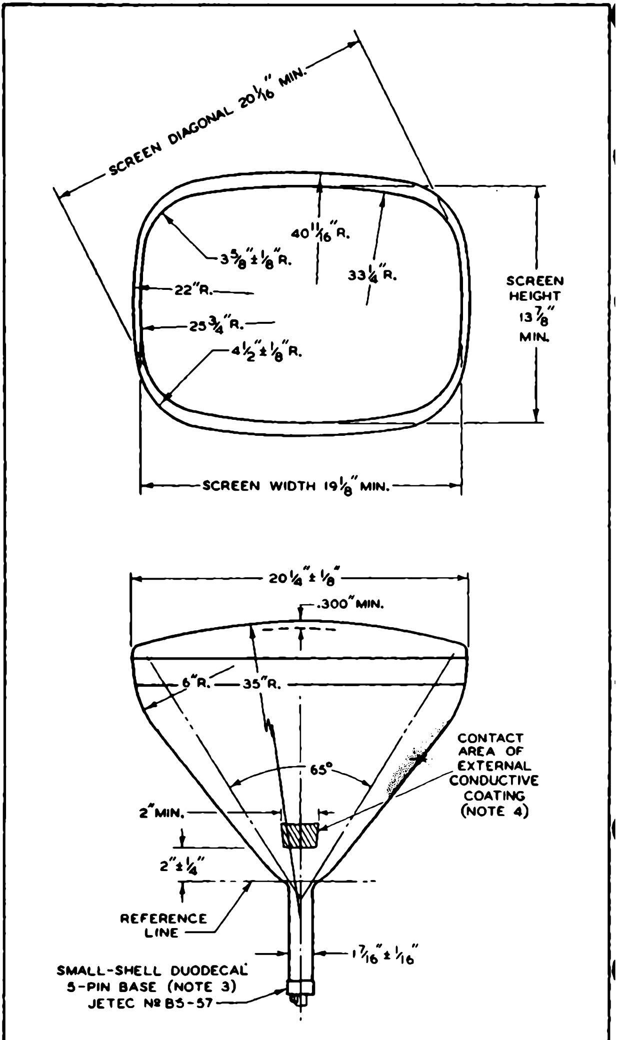
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

21EP4-A

RCA

21EP4-A

KINESCOPE



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21EP4-A

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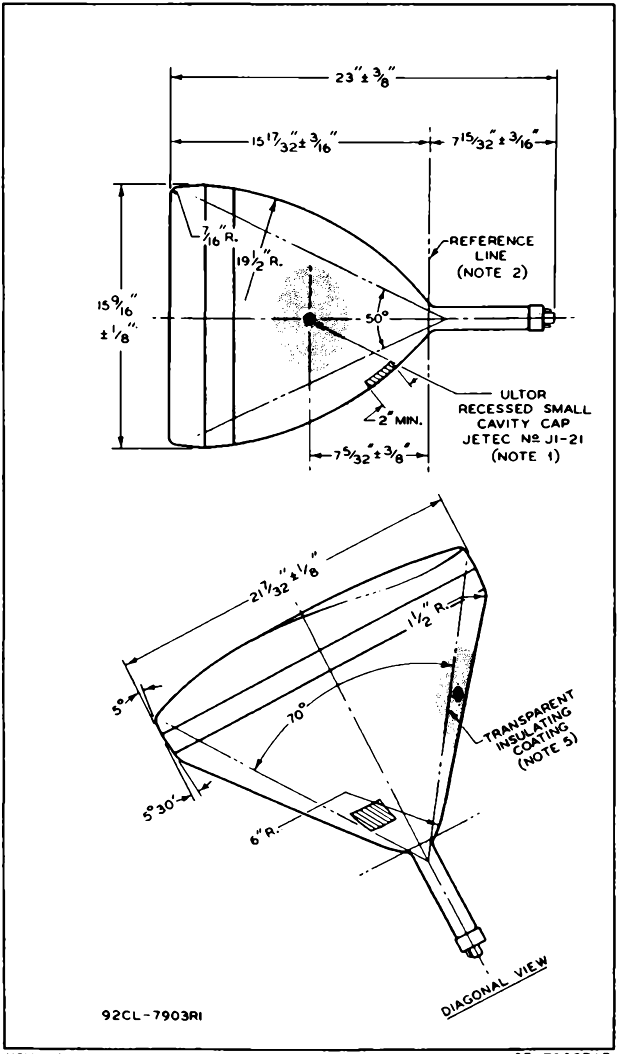

NOV. 1, 1955 CE-7903R1B

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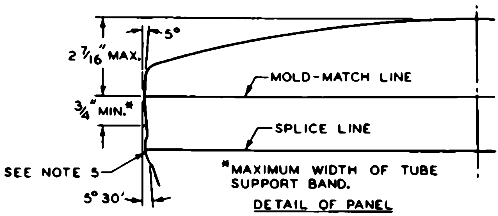
21EP4-A

21EP4-A

KINESCOPE



DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.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 VACANT PIN POSITION No.6.

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

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

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

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21EP4-B
KINESCOPE

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS

ALUMINIZED SCREEN
MAGNETIC DEFLECTION

The 21EP4-B is the same as the 21EP4-A except for the following item:

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

HIGHLIGHT BRIGHTNESS vs DRIVE CURVES for Type 21EP4-B are the same as those shown for Type 21ALP4-A

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21FP4-A

KINESCOPE

RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS MAGNETIC DEFLECTION

The 21FP4-A is the same as the 21FP4-C except that it utilizes a *non-aluminized phosphor* and has a light output as shown by the curves on the back of this sheet.

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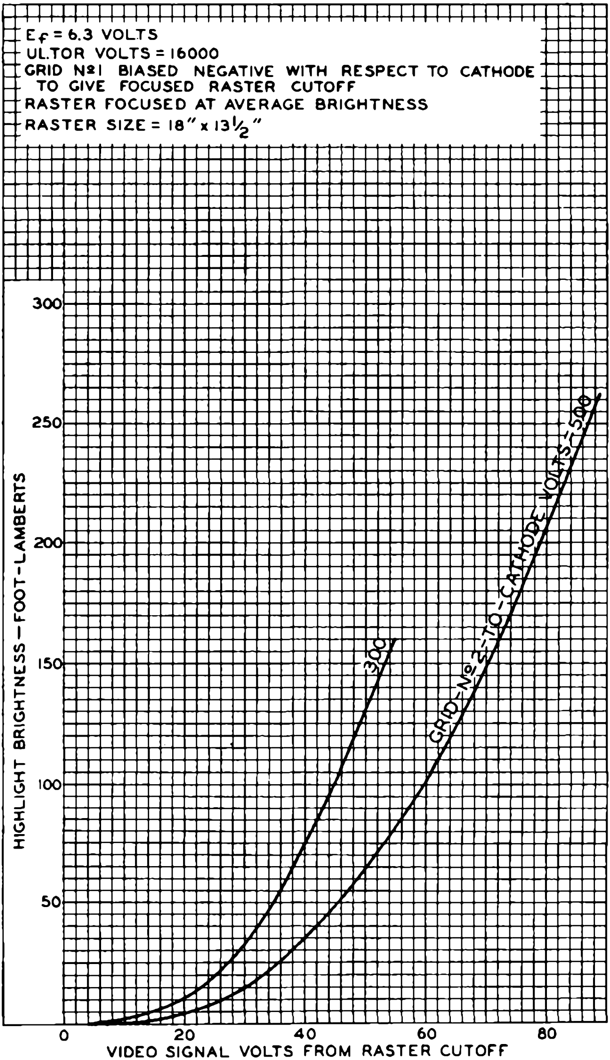
21FP4-A

AVERAGE GRID-DRIVE CHARACTERISTICS



21FP4-C

KINESCOPE

RECTANGULAR GLASS TYPE ALUMINIZED SCREEN
LOW-VOLTAGE FOCUS MAGNETIC DEFLECTION

DATA

General:

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

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes . . . . . . 6 μμf
- Cathode to all other electrodes . . . . 5 μμf
- External conductive coating to ultor . . . . {750 max. μμf; 500 min. μμf}

Faceplate, Cylindrical . . . . Filterglass
- Light transmission (Approx.) 71%

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 . . . . 70°
- Horizontal . . . . 65°
- Vertical . . . . 50°

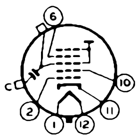
Ion-Trap Gun . . . . . . Requires External Single-Field Magnet

Tube Dimensions:
- Overall length . . . . 23" ± 3/8"
- Greatest width . . . . 20-1/4" ± 1/8"
- Greatest height . . . . 15-9/16" ± 1/8"
- Diagonal . . . . 21-7/32" ± 1/8"
- Neck length . . . . 7-15/32" ± 3/16"

Screen Dimensions (Minimum):
- Greatest width . . . . 19-1/8"
- Greatest height . . . . 13-7/8"
- Diagonal . . . . 20-1/16"
- Projected area . . . . 238 sq.in.

Weight (Approx.) . . . . 29 lbs
Mounting Position . . . . Any
Cap . . . . Recessed Small Cavity (JETEC No.J1-21)
Bulb J-170
Base . . . . Small-Shell Duodecal 6-Pin (JETEC No.B6-63)
- Basing Designation for BOTTOM VIEW 12L

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



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

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21FP4-C

21FP4-C
KINESCOPE

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	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

Equipment Design Ranges:

With any ultor voltage (Ec_5) between 14000# and 18000 volts and grid-No.2 voltage (Ec_2) between 200 and 500 volts

Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp	−0.4% to +2.2% of Ec_5	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	−9.3% to −24% of Ec_2	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	9.3% to 24% of Ec_2	volts
Grid-No.4 Current	−25 to +25	μamp
Grid-No.2 Current	−15 to +15	μamp
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{Ec_5}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet §	$\sqrt{\frac{Ec_5}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 14000 volts.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

21FP4-C

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Examples of Use of Design Ranges:

With ultor voltage of	*14000*	*16000*	*volts*
and grid-No.2 voltage of	*300*	*300*	*volts*
Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp . . .	-55 to +300	-65 to +350	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster.	-28 to -72	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	28 to 72	28 to 72	volts
Minimum Field Strength of PM Ion-Trap Magnet. . . .	31	33	gausses

Maximum Circuit Values:

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

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

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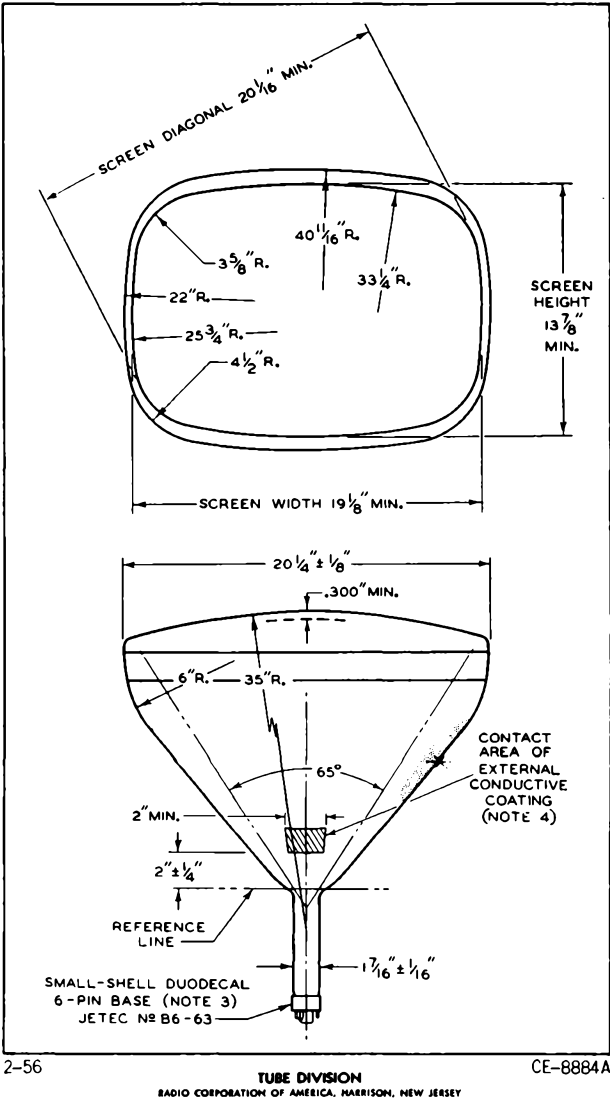

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21FP4-C
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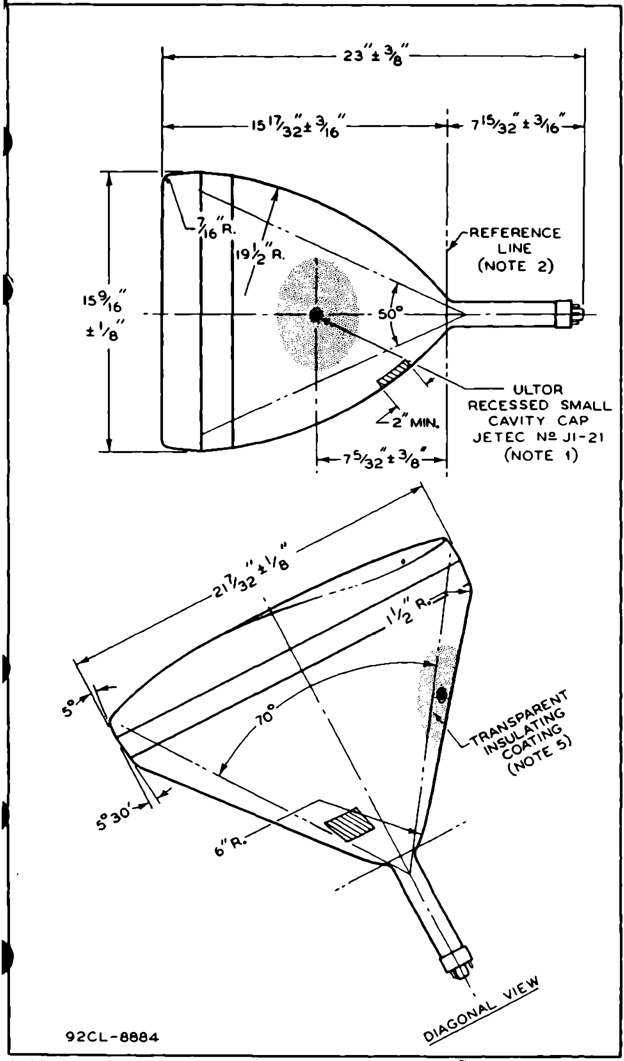

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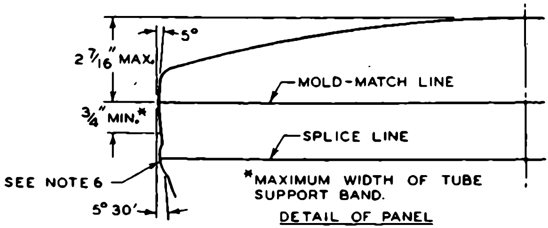

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN No.6.

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

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

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

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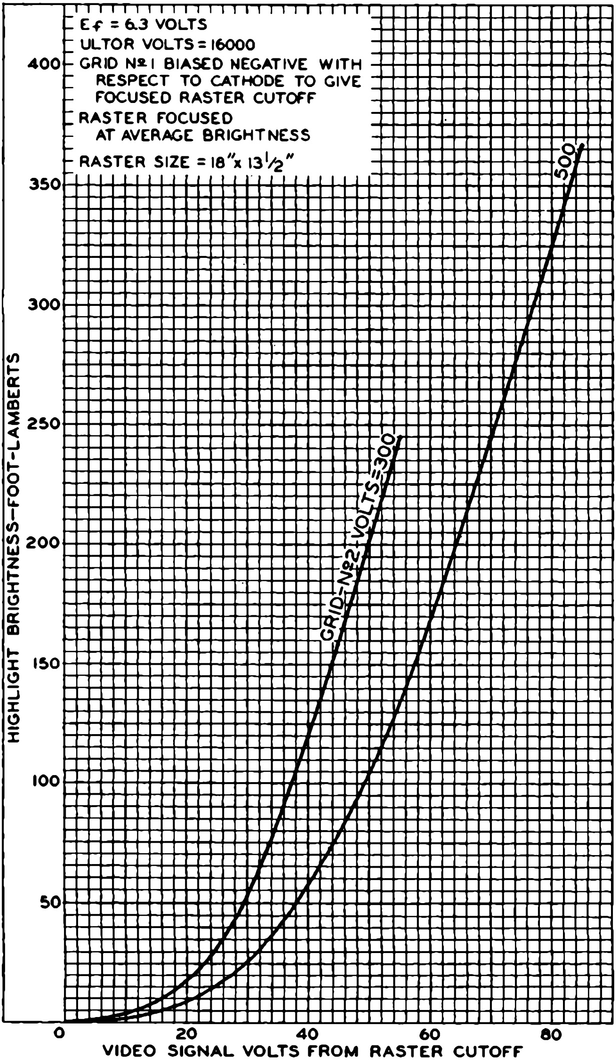
21FP4-C

AVERAGE GRID-DRIVE CHARACTERISTICS



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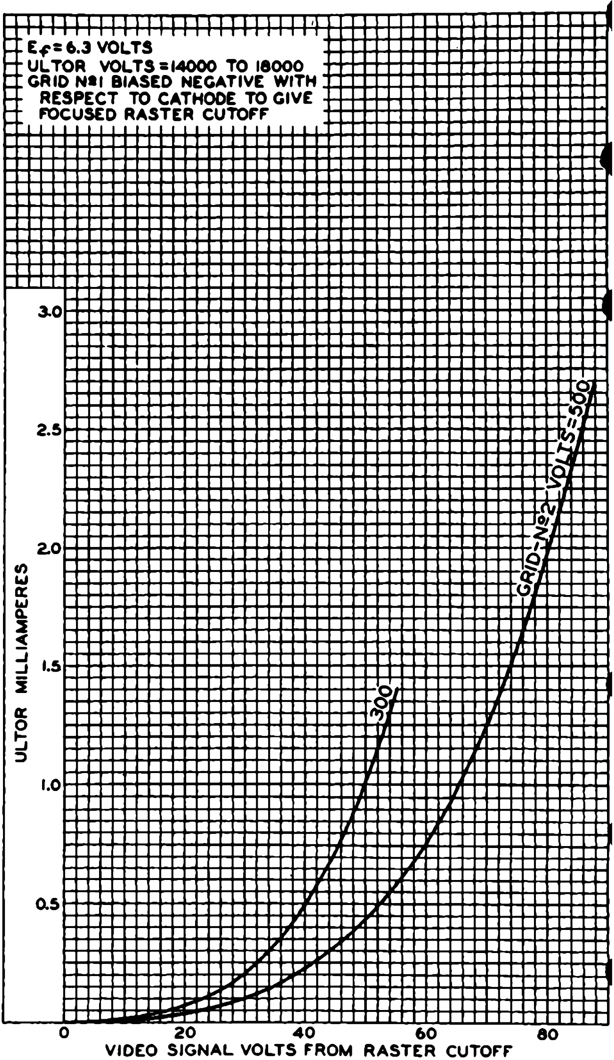
21FP4-C

AVERAGE GRID-DRIVE CHARACTERISTICS



21MP4

21MP4
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RECTANGULAR METAL-SHELL TYPE

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

Faceplate, Spherical . . . . Frosted Filterglass
- Light Transmission (Approx.) 66%

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

Focusing Method . . . . Electrostatic

Deflection Method . . . . Magnetic

Deflection Angles (Approx.):
- Diagonal . . . . 70°
- Horizontal . . . . 66°
- Vertical . . . . 50°

Ion-Trap Gun . . . . Requires External, Single-Field Magnet

Tube Dimensions:
- Maximum Overall Length . . . . 22-5/8"
- Greatest Diagonal . . . . 20-3/4" ± 1/4"
- Greatest Width . . . . 19-23/32" ± 1/8"
- Greatest Height . . . . 15-5/16" ± 1/8"

Screen Dimensions:
- Greatest Width . . . . 18-3/8"
- Greatest Height . . . . 14"
- Diagonal . . . . 19-3/8"

Weight (Approx.) . . . . 18 lbs

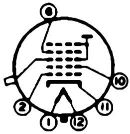
Mounting Position . . . . Any

Ultor● Terminal . . . . Metal-Shell Lip

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

BOTTOM VIEW

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



Pin 12 - Heater
Metal-Shell Lip- Grid No.3, Grid No.5, Collector

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

ULTOR● VOLTAGE . . . . 16000 max. volts

● In the 21MP4, grid No.5 which has the ultor function, grid No.3, 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

21MP4
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GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value*	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	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

Equipment Design Ranges:

For any ultor voltage (E_u) between 14000# and 16000 volts and grid-No.2 voltage (E_{c_2}) between 150 and 500 volts

Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp	−0.4% to +2.2% of E_u	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	11% to 25.7% of E_{c_2}	volts
Grid-No.4 Current	−25 to +25	μamp
Grid-No.2 Current	−15 to +15	μamp
Field Strength of Single-Field Ion-Trap Magnet (Approx.)	$\sqrt{\frac{E_u}{14000}} \times 45$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

For ultor voltage of	*14000*	*16000*	*volts*
and grid-No. 2 voltage of	*300*	*300*	*volts*
Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp	−55 to +300	−65 to +350	volts
Grid-No.1 Voltage†	−33 to −77	−33 to −77	volts
Ion-Trap Magnet (Rated Strength)	45	50	gausses

Maximum Circuit Values:

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

* This value has been specified to take care of the condition where an ac voltage is provided for dynamic focusing.

\# Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 14000 volts.

† For visual extinction of undeflected focused spot.

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

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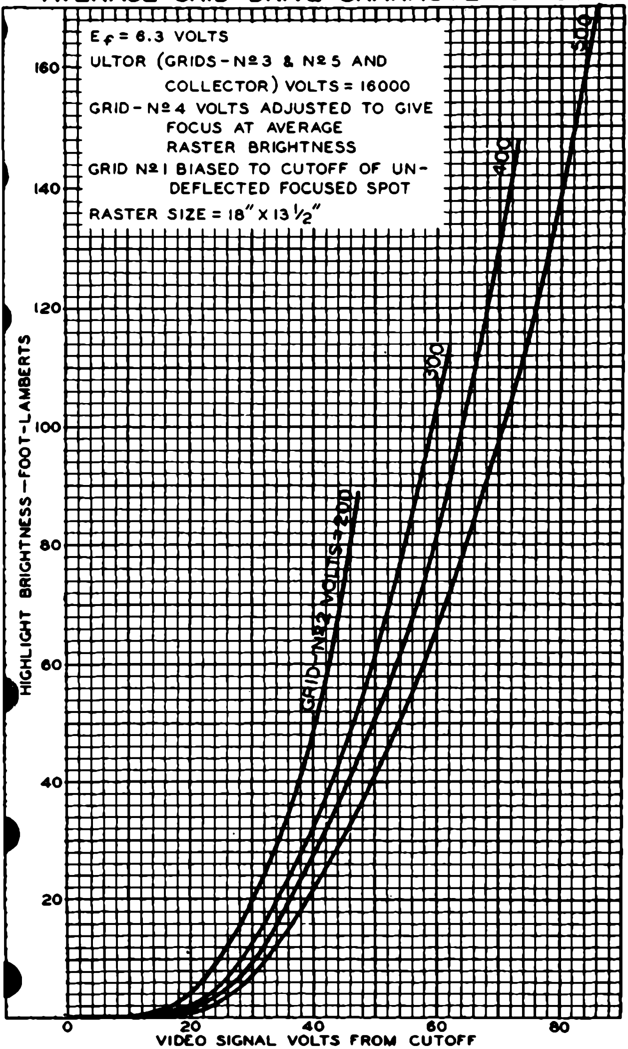
21MP4

AVERAGE GRID-DRIVE CHARACTERISTICS



21MP4

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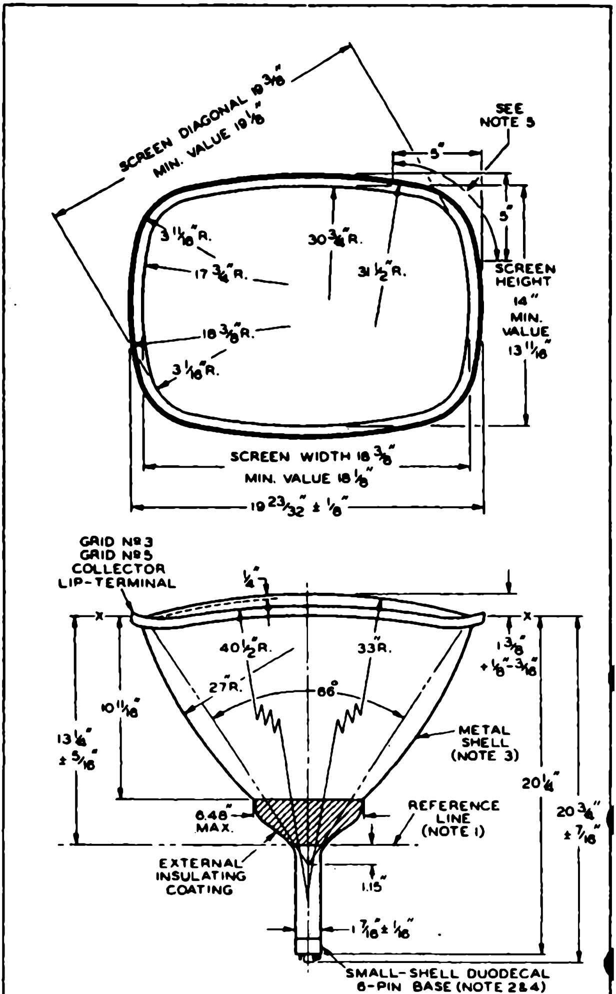

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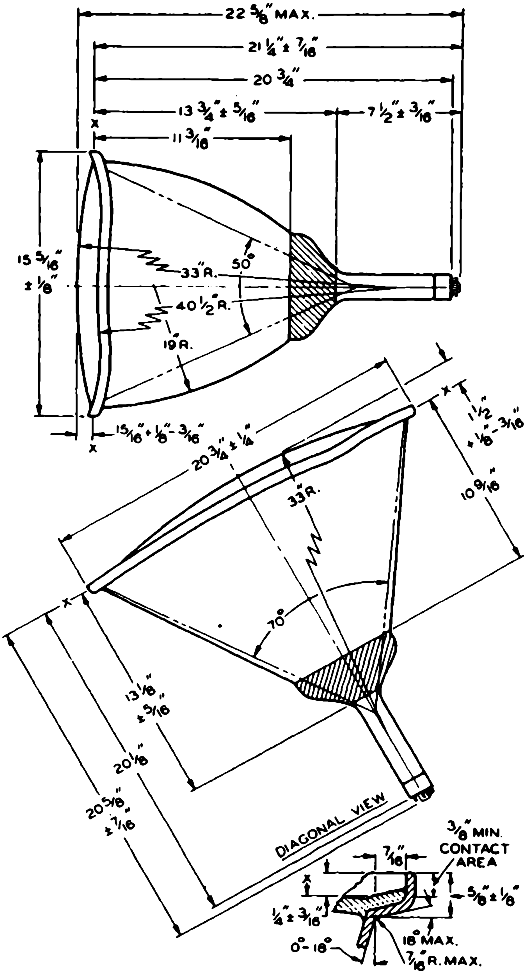
21MP4

21MP4
KINESCOPE



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FOR NOTES, SEE NEXT PAGE

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21MP4
KINESCOPE

NOTE 1: 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 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 3-1/4".

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.

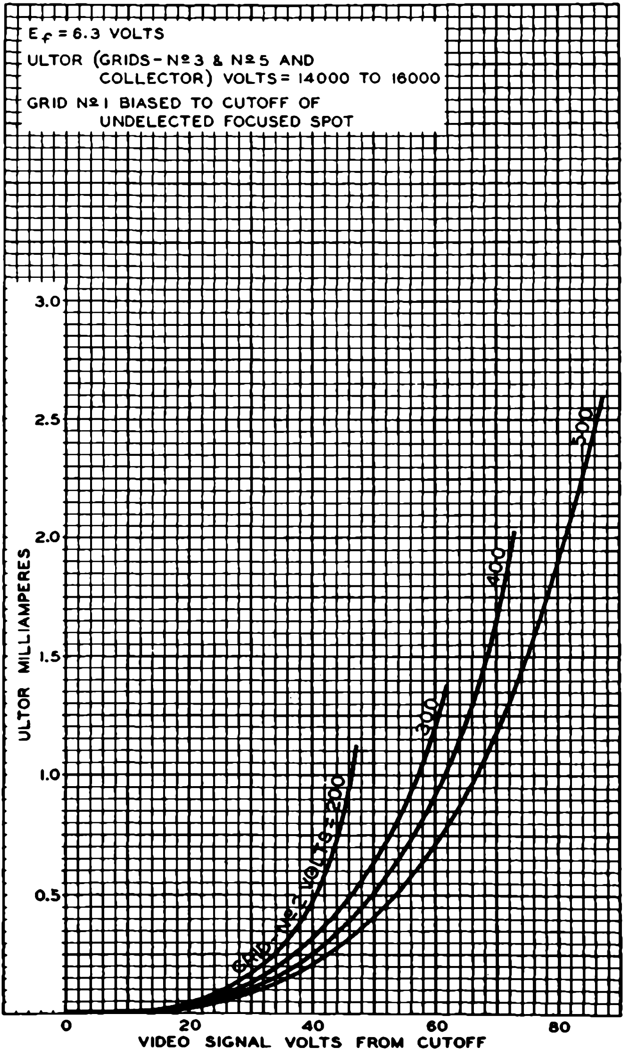
NOTE 4: THE PLANE THROUGH THE TUBE AXIS AND PIN NO. 6 MAY VARY FROM THE HORIZONTAL AXIS OF THE GLASS FACE BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF $\pm$ 10°.

NOTE 5: SUPPORT TUBE IN LIP REGION ONLY AT CORNERS WITHIN THIS SPACE.

21MP4

21MP4

AVERAGE GRID-DRIVE CHARACTERISTICS



NOV. 29, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7714

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21WP4, 21WP4-A

PICTURE TUBES

RECTANGULAR GLASS TYPES

MAGNETIC FOCUS — MAGNETIC DEFLECTION

21WP4
21WP4-A

DATA

General:

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

Capacitance between External Conductive Coating and Ultor . . . . 750 max. μμf; 500 min. μμf

Faceplate, Spherical . . . . Filterglass

Phosphor (For curves, see front of this section) . . . . *Type 21WP4*: P4—Sulfide Type; *Type 21WP4-A*: 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"

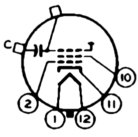
Screen Dimensions (Minimum):
- Greatest width . . . . 17-3/8"
- Greatest height . . . . 13-5/8"
- Diagonal . . . . 19-1/2"
- Projected area . . . . 224 sq. in.

Operating Position . . . . Any

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

Base . . Small-Shell Duodecal 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	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

RCA

21WP4, 21WP4-A
PICTURE TUBES

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

RCA

21XP4-A
PICTURE TUBE

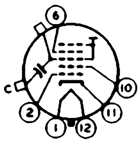
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

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. μμf / 2000 min. 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

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

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

RCA

21YP4

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RECTANGULAR GLASS TYPE

LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.6	amp

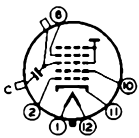
Direct Interelectrode Capacitances:

Grid No.1 to all other electrodes	6	μμf
Cathode to all other electrodes	5	μμf
External conductive coating to ultor°	750 max.	μμf
	500 min.	μμf

Faceplate, Spherical	Filterglass
Light Transmission (Approx.)	75%
Phosphor (For curves, see front of this Section)	P4—Sulfide Type
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	70°
Horizontal	65°
Vertical	50°
Ion-Trap Gun	Requires External Single-Field Magnet
Tube Dimensions:	
Overall length	23-1/32" ± 3/8"
Greatest width	20-1/4" ± 1/8"
Greatest height	15-9/16" ± 1/8"
Diagonal	21-7/32" ± 1/8"
Screen Dimensions (Minimum):	
Greatest width	19-1/8"
Greatest height	14-3/16"
Diagonal	20-1/8"
Projected area	245 sq. in.
Weight (Approx.)	24 lbs
Mounting Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Bulb	J170
Base	Small-Shell Duodecal 6-Pin (JETEC No.B6-63)

BOTTOM VIEW

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



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

° 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 power to its deflection. In the 21YP4, the ultor function is performed by grid No.5. Since grid No.5, grid No.3 and collector are connected together within the 21YP4, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

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21YP4

KINESCOPE

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR VOLTAGE	18000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value●	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	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

Equipment Design Ranges:

With any ultor voltage (E_{c5k}) between 14000■ and 18000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts

Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp	-0.4% to +2.2% of E_{c5k}	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of E_{c2k}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak positive)	9.3% to 24% of E_{c2k}	olts
Grid-No.4 Current	-25 to +25	μamp
Grid-No.2 Current	-15 to +15	μamp
Field Strength of Single-Field Ion-Trap Magnet (Approx.)	$\sqrt{\frac{E_{c5k}}{14000}} \times 40$	gausses
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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21YP4

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Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*18000*	*volts*
and grid-No. 2 voltage of	*300*	*300*	*volts*
Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp . .	-65 to +350	-70 to +395	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-28 to -72	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive) . . .	28 to 72	28 to 72	volts
Field Strength of Ion-Trap Magnet	43	45	gausses

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	18000 max.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value	1000 max.	volts
Negative value♦	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 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

■ 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 has been specified to take care of the condition where an ac voltage is provided for dynamic focusing.

*: See next page.

RCA

21YP4

KINESCOPE

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (E_{c5g1}) between 14000 and 18000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 220 and 620 volts*

Grid-No.4-to-Grid-No.1 Voltage for Focus with Ultor Current of 100 µamp	0% to +2.6% of E_{c5g1}	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	8.5% to 19.4% of E_{c2g1}	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak negative)	8.5% to 19.4% of E_{c2g1}	volts
Grid-No.4 Current	-25 to +25	µamp
Grid-No.2 Current	-15 to +15	µamp
Field Strength of Single-Field Ion-Trap Magnet (Approx.)	$\sqrt{\frac{E_{c5g1}}{14000}} \times 40$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*300*	*volts*
Grid-No.4-to-Grid-No.1 Voltage for Focus with Ultor Current of 100 µamp	0 to 415	0 to 470	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	25 to 58	25 to 58	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak negative)	25 to 58	25 to 58	volts
Field Strength of Ion-Trap Magnet	43	45	gausses

Maximum Circuit Values:

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

* Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-to-grid-No.1 voltage should not be less than 14000 volts.

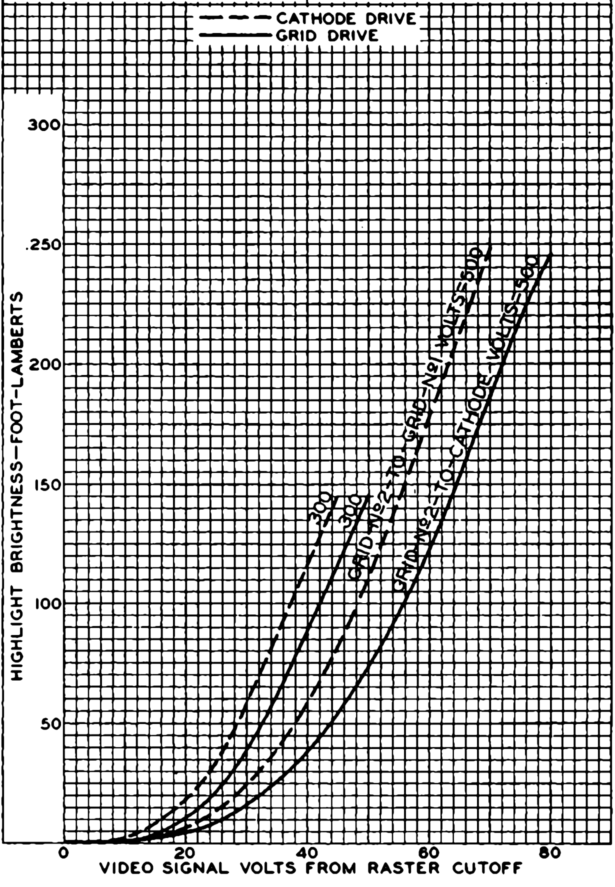
For x-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section.

21YP4

21YP4

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-No 1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID No 1 TO GIVE FOCUSED RASTER CUTOFF	GRID No 1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF
RASTER FOCUSED AT AVERAGE BRIGHTNESS	RASTER FOCUSED AT AVERAGE BRIGHTNESS
RASTER SIZE = 18" x 13½"	RASTER SIZE 18" x 13½"



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21YP4

21YP4
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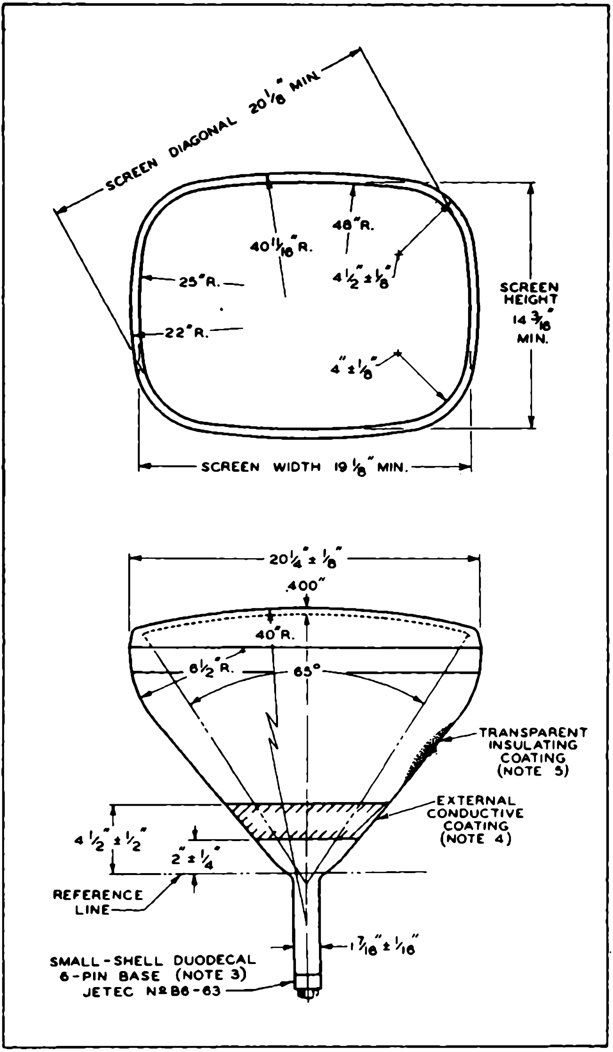

21YP4

21YP4

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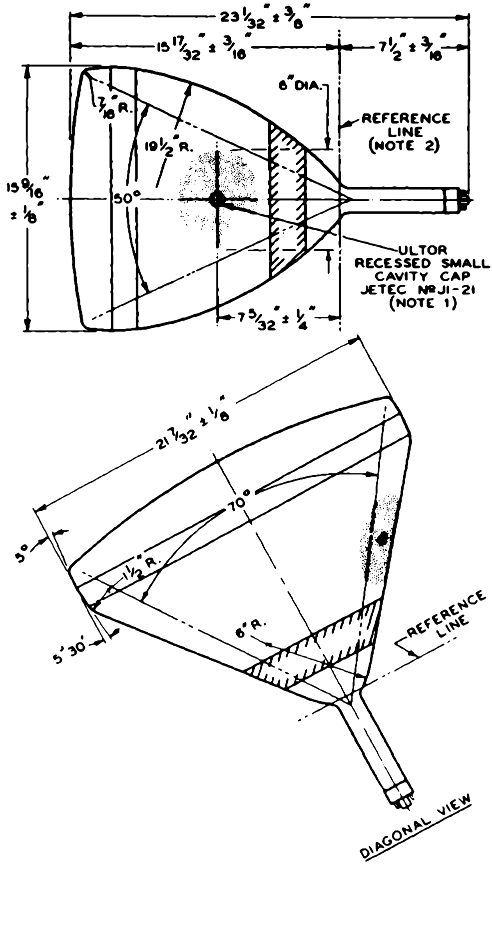

92CL - 8237

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21YP4

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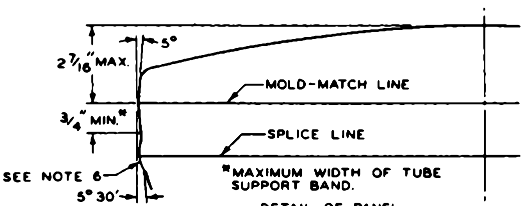


DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN No.6 MAY VARY FROM THE PLANE THROUGH THE AXIS AND BULB TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. BULB TERMINAL IS ON SAME SIDE AS PIN No.6.

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

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

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

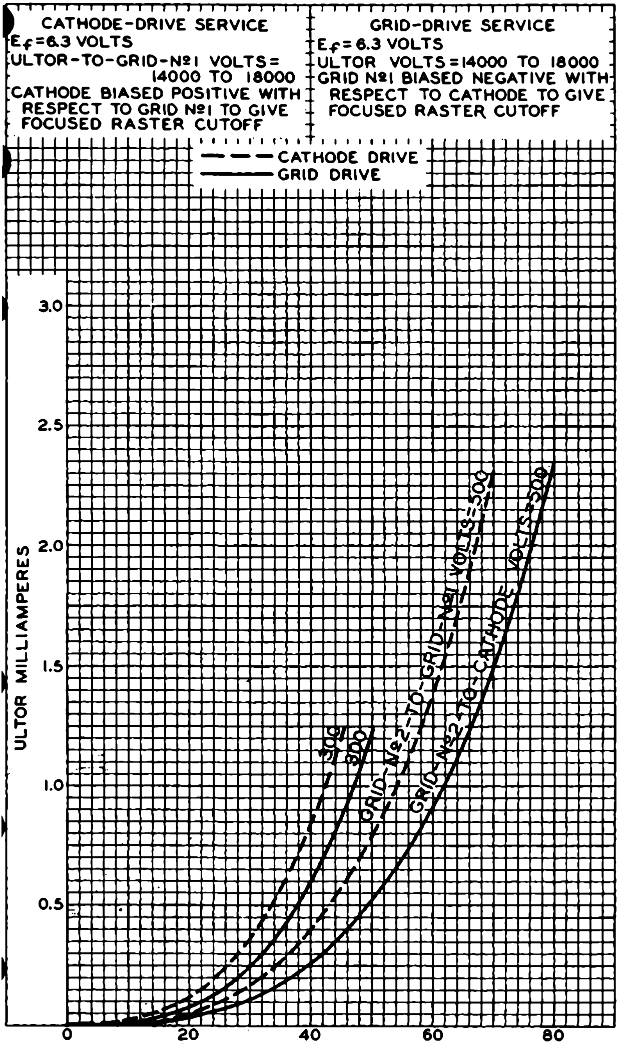
NOTE 5: TO CLEAN THIS AREA. WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: SEAL BULGE MAY PROTRUDE NOT MORE THAN 1/8" BEYOND MAXIMUM INDICATED VALUE FOR ENVELOPE WIDTH, DIAGONAL, OR HEIGHT.

21YP4

21YP4

AVERAGE DRIVE CHARACTERISTICS



21YP4-A

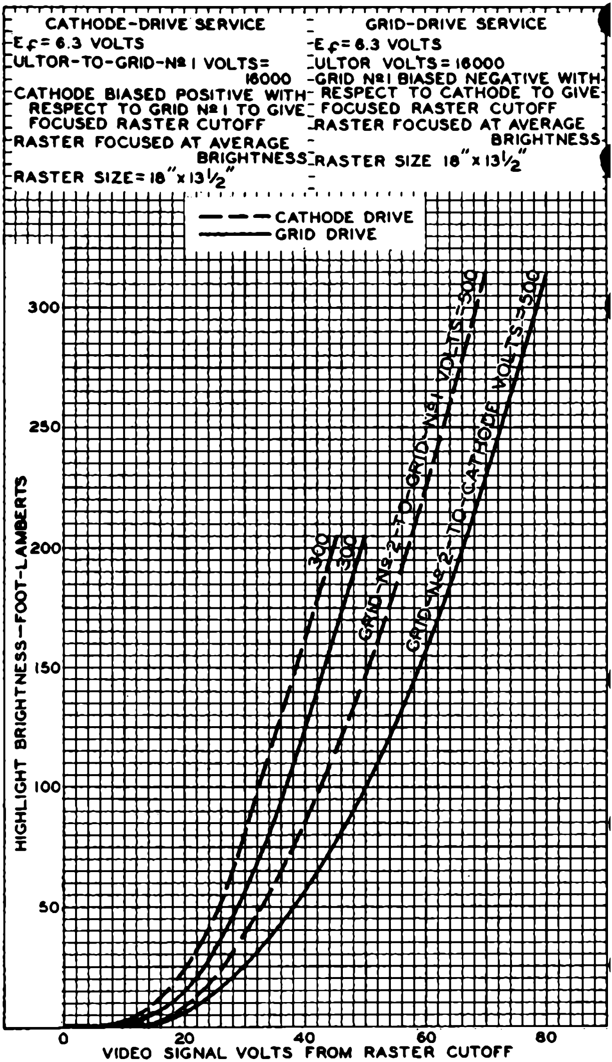
KINESCOPE

The 21YP4-A is like the 21YP4 except that it has a ***metal-backed screen*** and greater light output as shown by the curves on the back of this page.

RCA

21YP4-A

AVERAGE DRIVE CHARACTERISTICS



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21ZP4-A

KINESCOPE

RECTANGULAR GLASS TYPE

MAGNETIC FOCUS MAGNETIC DEFLECTION

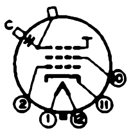
DATA

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 . . . . 6 μμf
 Cathode to all other electrodes . . . . . 5 μμf
 External conductive coating to ultor• . . {750 max. μμf / 500 min. μμf}
Faceplate, Spherical . . . . Filterglass
 Light Transmission (Approx.). 75%
Phosphor (For curves, see front of this Section). . P4—Sulfide Type
 Fluorescence . . . . White
 Phosphorescence . . . . White
 Persistence . . . . Short
Focusing Method . . . . Magnetic
Deflection Method . . . . Magnetic
Deflection Angles (Approx.):
 Diagonal . . . . 70°
 Horizontal . . . . 65°
 Vertical . . . . 50°
Ion-Trap Gun . . . . . Requires External Single-Field Magnet
Tube Dimensions:
 Overall length . . . . 23-1/32" ± 3/8"
 Greatest width . . . . 20-1/4" ± 1/8"
 Greatest height . . . . 15-9/16" ± 1/8"
 Diagonal. . . . . 21-7/32" ± 1/8"
Screen Dimensions (Minimum):
 Greatest width . . . . 19-1/8"
 Greatest height . . . . 14-3/16"
 Diagonal . . . . 20-1/8"
 Projected area . . . . 245 sq in
Weight (Approx.) . . . . 24 lbs
Mounting Position . . . . Any
Cap . . . . Recessed Small Cavity (JETEC No.J1-21)
Bulb J170
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 - Ultor (Grid No.3, Collector)
C - External Conductive Coating

• 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 21ZP4-A, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 21ZP4-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

RCA

21ZP4-A

KINESCOPE

GRID-DRIVE▲ SERVICE

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

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

Equipment Design Ranges:

With any ultor voltage (E_{c3k}) between 14000 and 18000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts*

Grid-No.1 Voltage for Visual Extinction of Focused Raster	-9.3% to -24% of E_{c2k}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak positive)	9.3% to 24% of E_{c2k}	volts
Grid-No.2 Current	-15 to +15	μamp
Focusing-Coil Current (DC)°	$\left[\sqrt{\frac{E_{c3k}}{14000}} \times 104\right] \pm 10\%$	ma
Field Strength of Single-Field Ion-Trap Magnet (Approx.)	$\sqrt{\frac{E_{c3k}}{14000}} \times 42$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*18000*	*volts*
and grid-No.2 voltage of	*300*	*300*	*volts*
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-28 to -72	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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21ZP4-A

KINESCOPE

Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	28 to 72	28 to 72	volts
Focusing-Coil Current (DC). .	110 ± 10%	118 ± 10%	ma
Field Strength of Ion-Trap Magnet	45	48	gausses

Maximum Circuit Values:

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

CATHODE-DRIVE■ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE	18000 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 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_{c3g1}) between 14000 and 18000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 220 and 620 volts*

Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	8.5% to 19.4% of E_{c2g1}	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)	8.5% to 19.4% of E_{c2g1}	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.

* Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-to-grid-No.1 voltage should not be less than 14000 volts.

°: See next page.

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Grid-No.2 Current	-15 to +15		μamp
Focusing-Coil Current (DC)°. .	$\left[\sqrt{\frac{E_{c3g1}}{14000}} \times 104\right] \pm 10\%$		
Field Strength of Single-Field Ion-Trap Magnet (Approx.). .	$\sqrt{\frac{E_{c3g1}}{14000}} \times 42$		gausses
Field Strength of Adjustable Centering Magnet	0 to 8		gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*300*	*volts*
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	25 to 58	25 to 58	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak negative)	25 to 58	25 to 58	volts
Focusing-Coil Current (DC) . . .	110 ± 10%	118 ± 10%	ma
Field Strength of Ion-Trap Magnet	45	48	gausses

Maximum Circuit Values:

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

° For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (See *Dimensional Outline*). The indicated current is for condition with combined grid-No.1 bias voltage and video signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 19-1/8" x 14-3/16" picture area sharply focused at center of screen.

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

Ultor current vs Drive Curves are the same as shown for Type 21YP4

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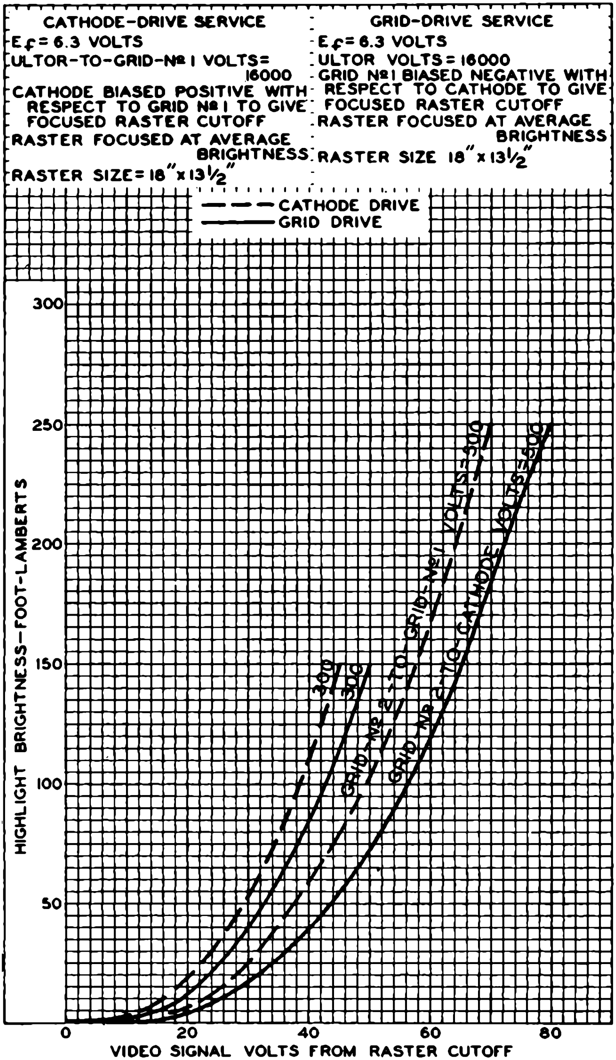
21ZP4-A

21ZP4-A

AVERAGE DRIVE CHARACTERISTICS



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21ZP4-A

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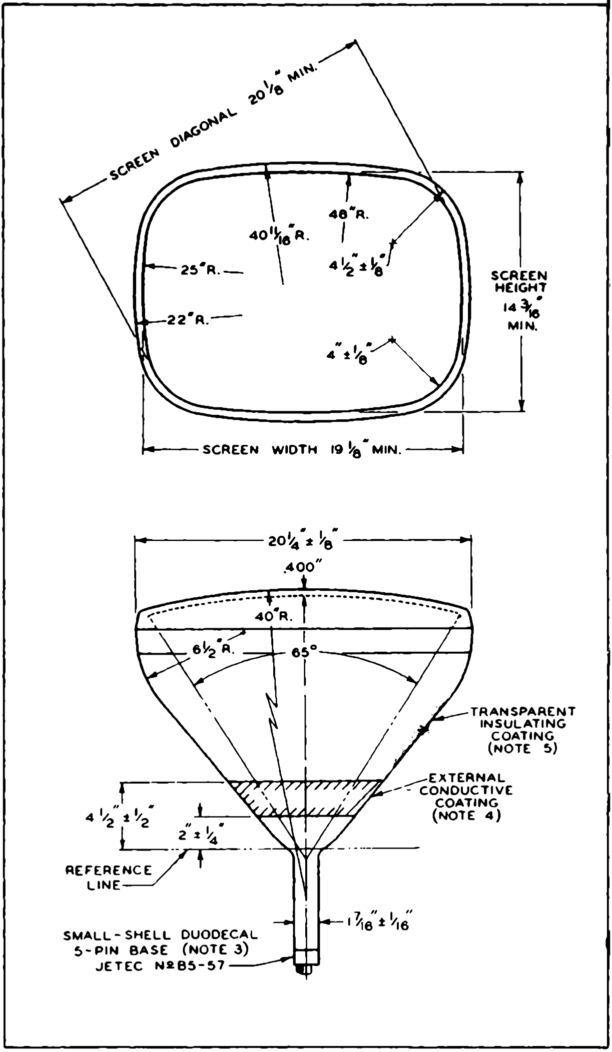

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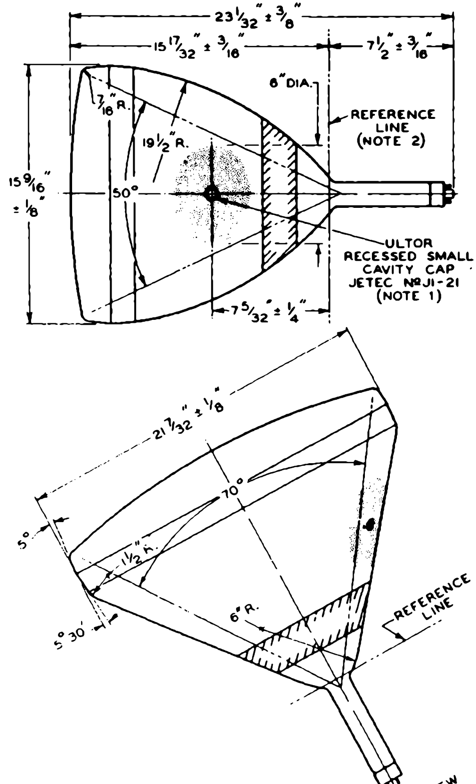
21ZP4-A

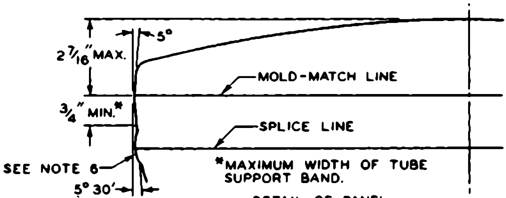
KINESCOPE



92CL-8132R1

21ZP4-A

KINESCOPE



DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND BULB TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. BULB TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.

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

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

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: SEAL BULGE MAY PROTRUDE NOT MORE THAN 1/8" BEYOND MAXIMUM INDICATED VALUE FOR ENVELOPE WIDTH, DIAGONAL, OR HEIGHT.

RCA

21ZP4-B

KINESCOPE

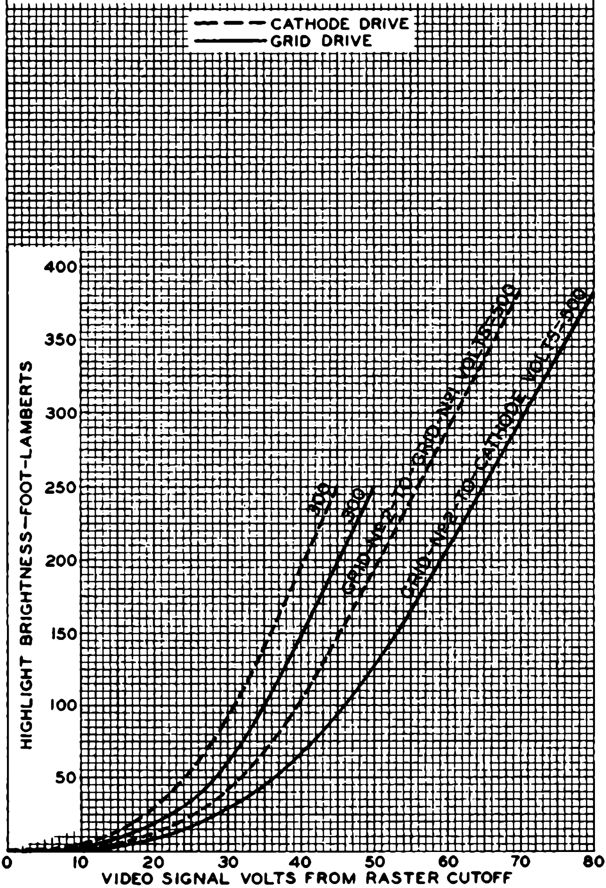
The 21ZP4-B is like the 21ZP4-A except that it has a ***metal-backed screen*** and greater light output as shown by the curves on the back of this page.

RCA

21ZP4-B

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" x 13½"	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" x 13½"



24AUP4

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)

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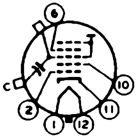
24AUP4

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.

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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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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

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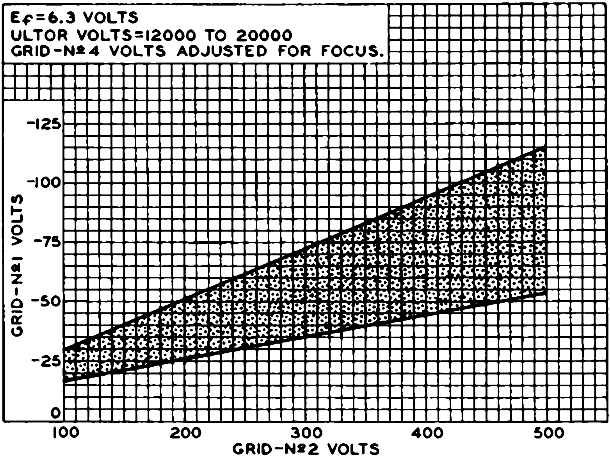
RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



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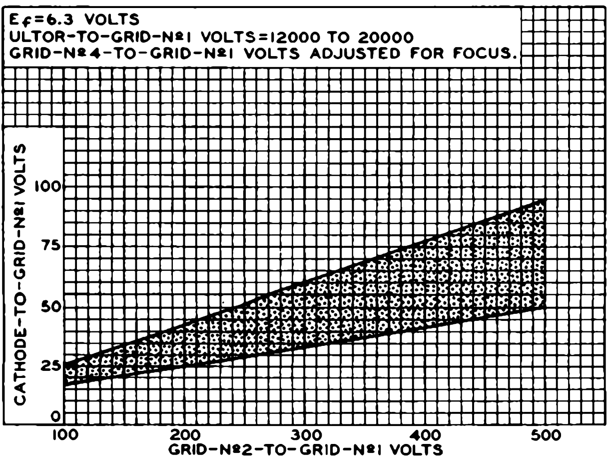
CATHODE-DRIVE SERVICE



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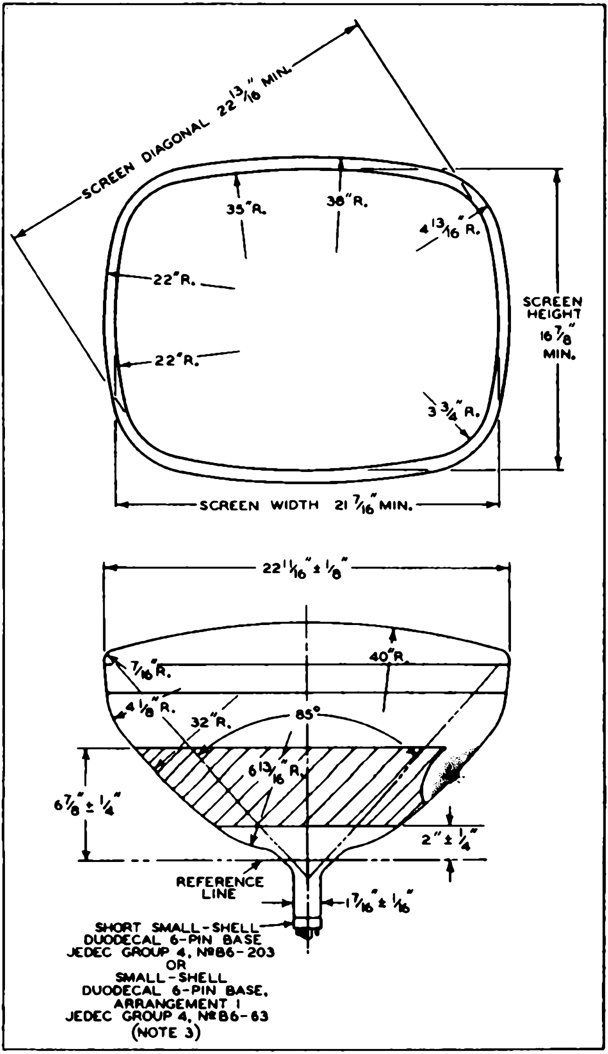
24AUP4
PICTURE TUBE



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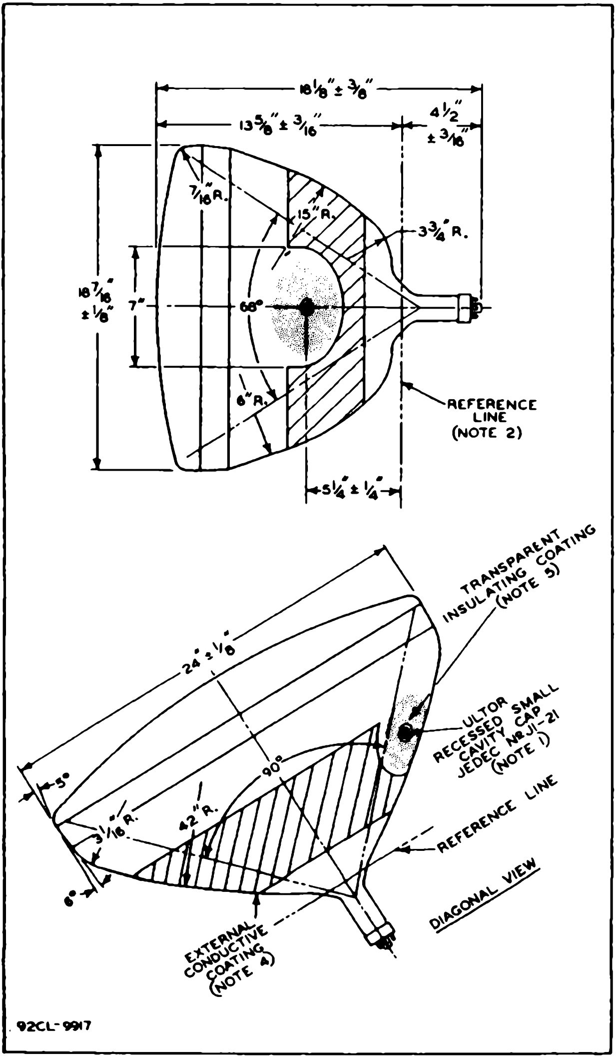
PICTURE TUBE



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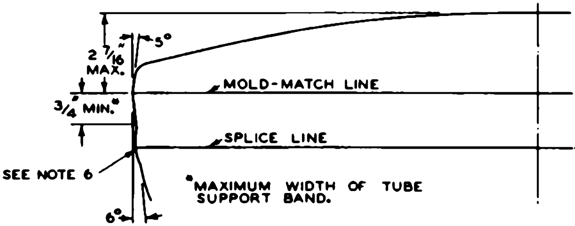
PICTURE TUBE



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 3".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

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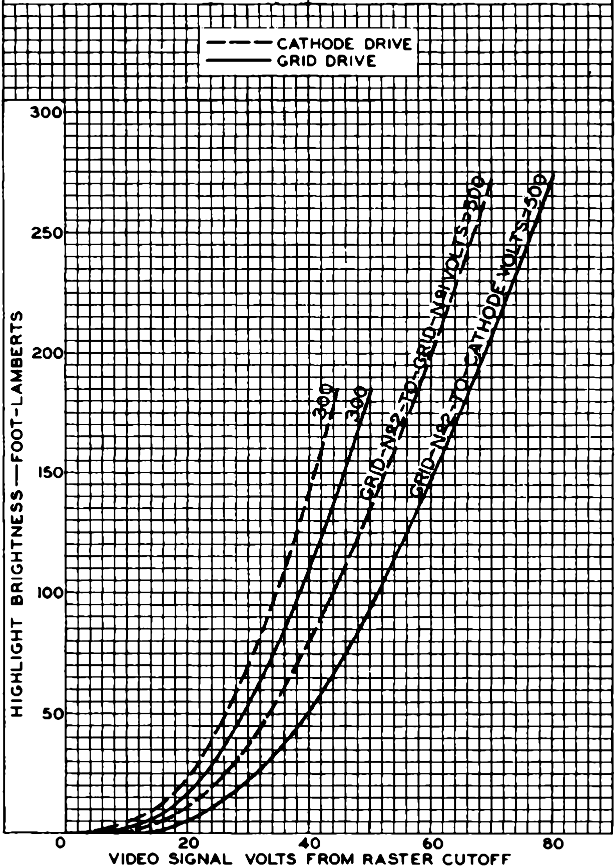
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-No.1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF.	GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.
RASTER FOCUSED AT AVERAGE BRIGHTNESS.	RASTER FOCUSED AT AVERAGE BRIGHTNESS.
RASTER SIZE = 21" x 16"	RASTER SIZE = 21" x 16"



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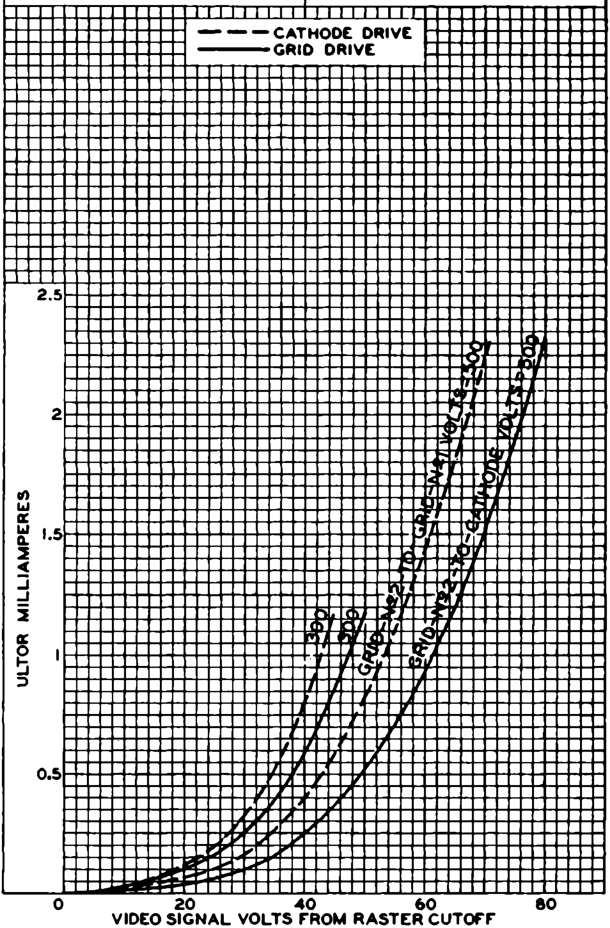
AVERAGE DRIVE CHARACTERISTICS

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.



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24CP4-A
KINESCOPE

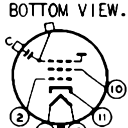
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:		
Voltage	6.3	ac or dc volts
Current	0.6 ± 10%	amp ←
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●	750 max. / 500 min.	$\mu\mu$f
Faceplate, Spherical		Filterglass
Light transmission (Approx.)		71% ←
Phosphor (For curves, see front of this section)		P4—Sulfide Type Aluminized ←
Fluorescence		White
Phosphorescence		White
Persistence		Short
Focusing Method		Magnetic
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal		90°
Horizontal		85°
Vertical		68° ←
Ion-Trap Gun		Requires External Single-Field Magnet
Tube Dimensions:		
Overall length		21-1/8" ± 3/8"
Greatest width		22-11/16" ± 1/8"
Greatest height		18-7/16" ± 1/8"
Diagonal		24" ± 1/8"
Screen Dimensions (Minimum):		
Greatest width		21-1/4"
Greatest height		16-3/4"
Diagonal		22-5/8"
Projected area		319 sq. in. ←
Weight (Approx.)		35 lbs
Mounting Position		Any
Cap		Recessed Small Cavity (JETEC No.J1-21)
Bulb		J192
Base		Small-Shell Duodecal 5-Pin (JETEC 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

● 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 24CP4-A, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 24CP4-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

← Indicates a change.

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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.	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

Equipment Design Ranges:

With any ultor voltage (E_{c_3k}) between 16000* and 20000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.1 Voltage for Visual Extinction of Focused Raster.	-9.3% to -24% of E_{c_2k}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	9.3% to 24% of E_{c_2k}	volts
Grid-No.2 Current	-15 to +15	µamp
→ Focusing-Coil Current (DC)° .	$\left[\sqrt{\frac{E_{c_3k}}{16000}} \times 108\right] \pm 20\%$	ma
→ Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_3k}}{16000}} \times 30$	ma
→ Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_3k}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*18000*	*volts*
→ *and grid-No.2 voltage of*	*300*	*400*	*volts*
→ Grid-No.1 Voltage for Visual Extinction of Focused Raster.	-28 to -72	-37 to -96	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.

→ Indicates a change.

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Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	28 to 72	37 to 96	volts ←
Focusing-Coil Current (DC). .	108 ± 20%	115 ± 20%	ma ←
Minimum Field Strength of PM Ion-Trap Magnet.	33	35	gausses ←

Maximum Circuit Values:

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

CATHODE-DRIVE[■] SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-GRID-No.1 VOLTAGE.	20000 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE.	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE.	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 max.	volts
Negative bias value	0 max.	volts
Negative peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds.	410 max.	volts
After equipment warm-up period.	180 max.	volts
Heater positive with respect to cathode .	180 max.	volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_3g_1}$) between 16000[•] and 20000 volts and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 220 and 620 volts

Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	8.5% to 19.4% of $E_{c_2g_1}$	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak negative)	8.5% to 19.4% of $E_{c_2g_1}$	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.

• Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-to-grid-No.1 voltage should not be less than 16000 volts.

○: See next page.

← Indicates a change.

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KINESCOPE

Grid-No.2 Current.	-15 to +15		μamp
→ Focusing-Coil Current (DC)°. .	$\left[\sqrt{\frac{E_{c_3 g_1}}{16000}} \times 108\right] \pm 20\%$		ma
→ Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_3 g_1}}{16000}} \times 30$		ma
→ Minimum Field Strength of PM Ion-Trap Magnet§.	$\sqrt{\frac{E_{c_3 g_1}}{16000}} \times 33$		gausses
Field Strength of Adjustable Centering Magnet	0 to 8		gausses

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

With ultor-to-grid-No.1 voltage of	*16000*	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster.	25 to 58	34 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak negative)	25 to 58	34 to 78	volts
Focusing-Coil Current (DC) . . .	108 ± 20%	115 ± 20%	ma
Minimum Field Strength of PM Ion-Trap Magnet	33	35	gausses

Maximum Circuit Values:

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

° For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line *(See Dimensional Outline)*. The indicated current is for condition with sharp focus at center of picture area and combined grid-No.1 voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts measured on an Indian Head Test Pattern set for a 21" x 16" picture size.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

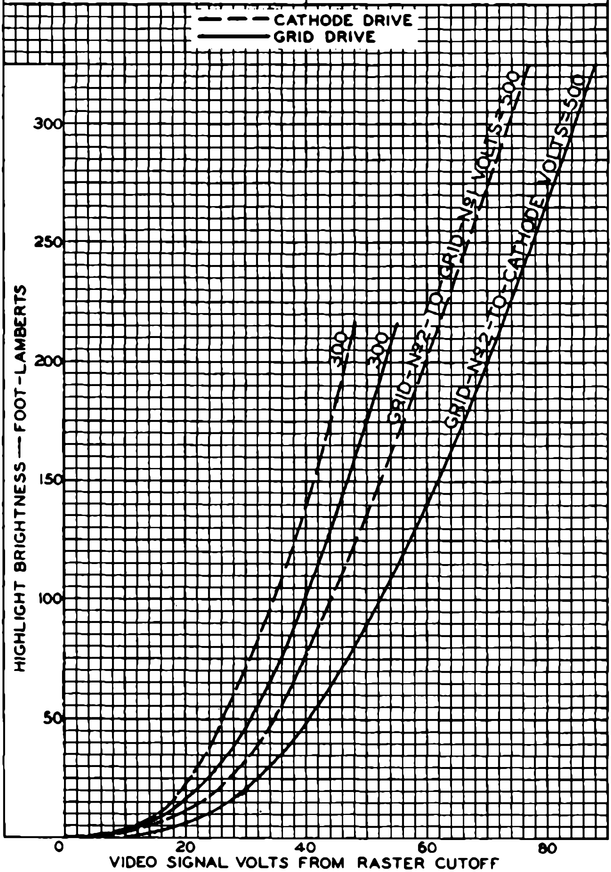
→ Indicates a change.

24CP4-A

24CP4-A

AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
Ef = 6.3 VOLTS	Ef = 6.3 VOLTS
ULTOR-TO-GRID-No.1 VOLTS = 16000	ULTOR VOLTS = 16000
CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF	GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF
RASTER FOCUSED AT AVERAGE BRIGHTNESS	RASTER FOCUSED AT AVERAGE BRIGHTNESS
RASTER SIZE = 21" x 16"	RASTER SIZE = 21" x 16"



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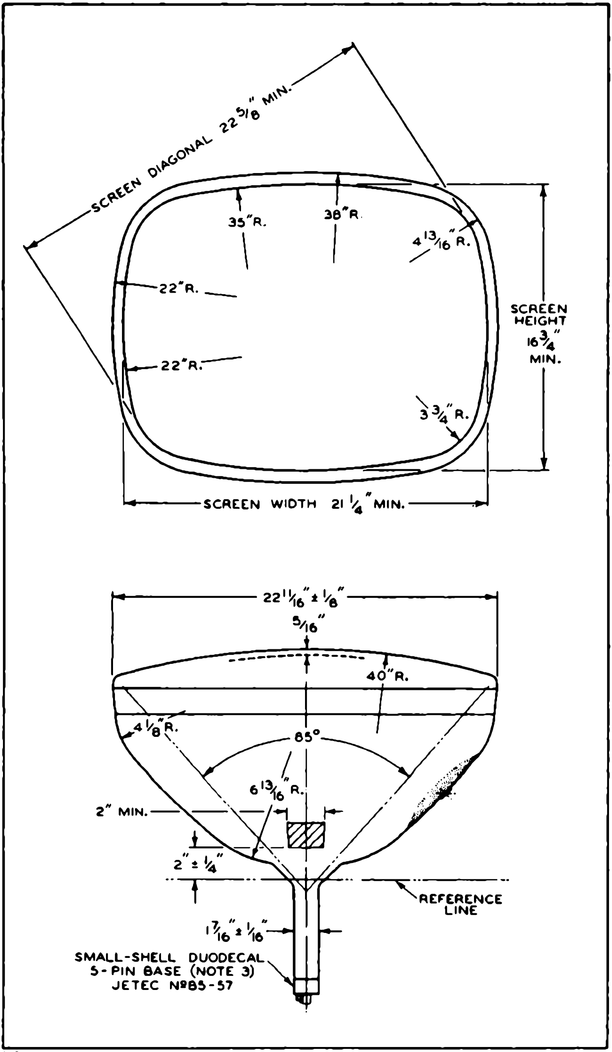

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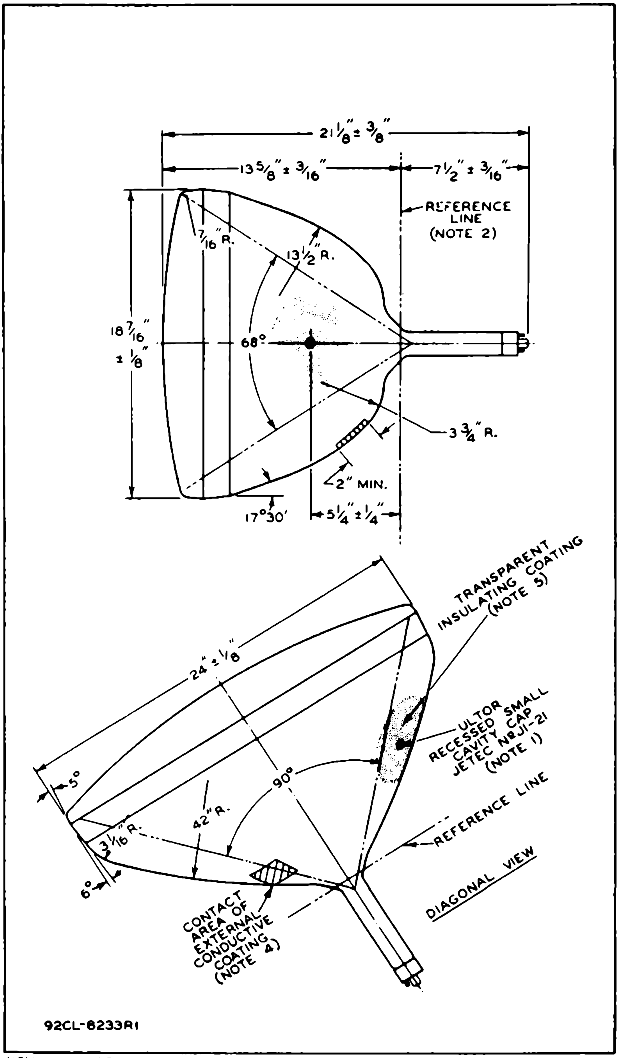

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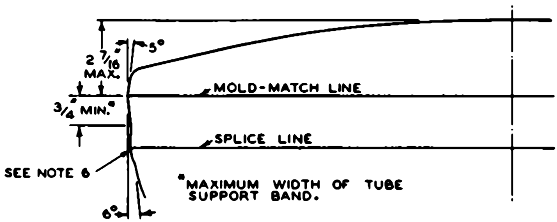
KINESCOPE



DETAIL OF PANEL

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.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 VACANT PIN POSITION No.6.

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

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

NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

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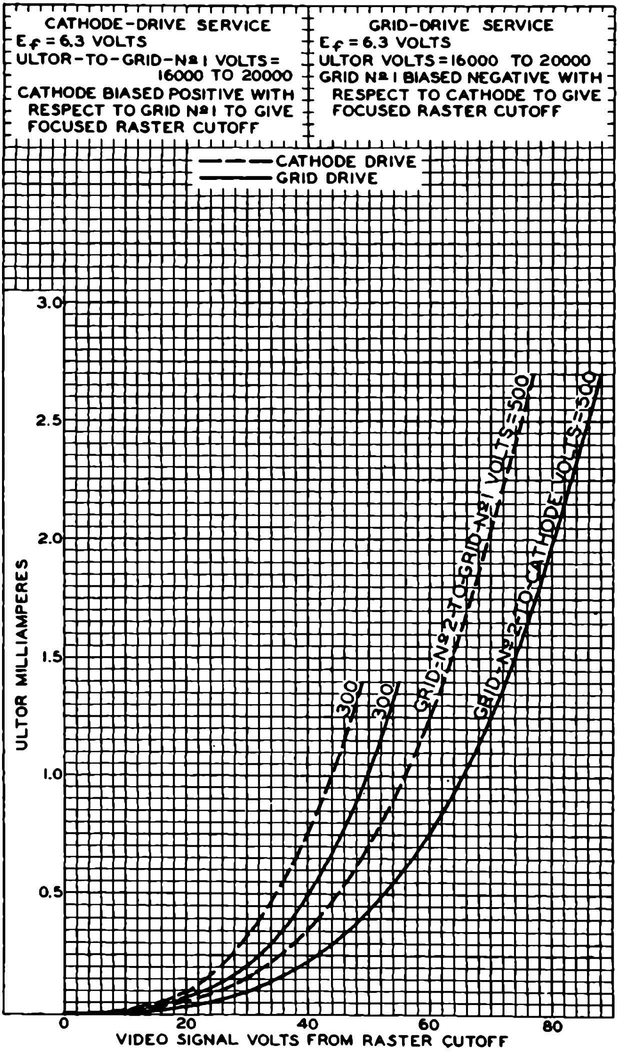
AVERAGE DRIVE CHARACTERISTICS



24DP4-A
KINESCOPE

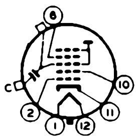
RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN
LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:	
Voltage	6.3 ac or dc volts
Current	0.6 ± 10% amp
Direct Interelectrode Capacitances:	
Grid No.1 to all other electrodes	6 μμf
Cathode to all other electrodes	5 μμf
External conductive coating to ultor●	750 max. μμf 500 min. μμf
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	71%
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°
Ion-Trap Gun	Requires External Single-Field Magnet
Tube Dimensions:	
Overall length	21-1/8" ± 3/8"
Greatest width	22-11/16" ± 1/8"
Greatest height	18-7/16" ± 1/8"
Diagonal	24" ± 1/8"
Screen Dimensions (Minimum):	
Greatest width	21-1/4"
Greatest height	16-3/4"
Diagonal	22-5/8"
Projected area	319 sq. in.
Weight (Approx.)	35 lbs
Mounting Position	Any
Cap	Recessed Small Cavity (JETEC No.J1-21)
Bulb	J192
Base	Small-Shell Duodecal 6-Pin (JETEC No.B6-63)
Basing Designation for BOTTOM VIEW	12L

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



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

●: See next page.

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24DP4-A

KINESCOPE

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR● VOLTAGE	20000 max.	volts
GRID-No.4 VOLTAGE:		
Positive value	1000 max.	volts
Negative value*	500 max.	volts
GRID-No.2 VOLTAGE	500 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	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

Equipment Design Ranges:

With any ultor voltage (E_{c_5k}) between 16000# and 20000 volts and grid-No.2 voltage (E_{c_2k}) between 200 and 500 volts

Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp	−0.4% to +2.2% of E_{c_5k}	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	−9.3% to −24% of E_{c_2k}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	9.3% to 24% of E_{c_2k}	volts
Grid-No.4 Current	−25 to +25	μamp
Grid-No.2 Current	−15 to +15	μamp
Ion-Trap Magnet Current (Average)**	$\sqrt{\frac{E_{c_5k}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§	$\sqrt{\frac{E_{c_5k}}{16000}} \times 33$	gausses
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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Examples of Use of Design Ranges:

With ultor voltage of	*16000*	*18000*	*volts*
and grid-No.2 voltage of	*300*	*400*	*volts*
Grid-No.4 Voltage for Focus with Ultor Current of 100 μamp. . .	-65 to +350	-75 to +400	volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster	-28 to -72	-37 to -96	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak positive)	28 to 72	37 to 96	volts
Minimum Field Strength of PM Ion-Trap Magnet . . .	33	35	gausses

Maximum Circuit Values:

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

CATHODE-DRIVE● SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR●-TO-GRID-No.1 VOLTAGE.	20000 max.	volts
GRID-No.4-TO-GRID-No.1 VOLTAGE:		
Positive value	1000 max.	volts
Negative value*.	500 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value.	125 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

● 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 24DP4-A, the ultor function is performed by grid No.5. Since grid No.5, grid No.3, and collector are connected together within the 24DP4-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

* This value has been specified to take care of the condition where an ac voltage is provided for dynamic focusing.

● 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.

24DP4-A

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Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ($E_{c_5g_1}$) between 16000# and 20000 volts

and grid-No.2-to-grid-No.1 voltage ($E_{c_2g_1}$) between 220 and 620 volts

Grid-No.4-to-Grid-No.1 Voltage for Focus with Ultor Current of 100 μamp.	0% to 2.6% of $E_{c_5g_1}$	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster.	8.5% to 19.4% of $E_{c_2g_1}$	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak negative)	8.5% to 19.4% of $E_{c_2g_1}$	volts
Grid-No.4 Current.	-25 to +25	μamp
Grid-No.2 Current.	-15 to +15	μamp
Ion-Trap Magnet Current (Average)**.	$\sqrt{\frac{E_{c_5g_1}}{16000}} \times 30$	ma
Minimum Field Strength of PM Ion-Trap Magnet§.	$\sqrt{\frac{E_{c_5g_1}}{16000}} \times 33$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor-to-grid-No.1 voltage of	*16000*	*18000*	*volts*
and grid-No.2-to-grid-No.1 voltage of	*300*	*400*	*volts*
Grid-No.4-to Grid-No.1 Voltage for Focus with Ultor Current of 100 μamp.	0 to 415	0 to 470	volts
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster.	25 to 58	34 to 78	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak negative)	25 to 58	34 to 78	volts
Minimum Field Strength of PM Ion-Trap Magnet	33	35	gausses

Maximum Circuit Values:

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

#,**,§: See next page.

24DP4-A
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\# Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 16000 volts.

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

§ For specimen PM ion-trap magnet, such as Heppner Model No.E437, or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

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

DIMENSIONAL OUTLINE

for Type 24DP4-A is the same as that shown for Type 24CP4-A, except that the 24DP4-A has a Small-Shell Duodecal 6-Pin Base

CURVES

for Type 24DP4-A are the same as those shown for Type 24CP4-A

24YP4

24YP4
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RECTANGULAR GLASS TYPE — ALUMINIZED SCREEN

LOW-VOLTAGE FOCUS — MAGNETIC DEFLECTION

The 24YP4 is the same as the 24DP4-A except for the following items:

Direct Interelectrode Capacitances:

External conductive coating to ultor. . .	1500 max.	μμf
	1200 min.	μμf

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RECTANGULAR METAL-SHELL TYPE — METAL-BACKED SCREEN
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	Frosted Filterglass
Light Transmission (Approx.)	66%
Phosphor (For curves, see front of this Section)	P4--Sulfide Type
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Magnetic
Deflection Method	Magnetic

Deflection Angles (Approx.):

Diagonal	90°
Horizontal	85°
Vertical	69°
Ion-Trap Gun	Requires External, Single-Field Magnet

Tube Dimensions:

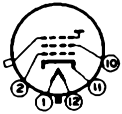
Maximum Overall Length	22-3/16"
Greatest Diagonal	26-7/8" ± 1/4"
Greatest Width	25-1/4" ± 3/16"
Greatest Height	19-15/16" ± 3/16"

Screen Dimensions (Minimum):

Greatest Width	23-7/16"
Greatest Height	18-1/8"
Diagonal	25-1/16"
Weight (Approx.)	30 lbs
Mounting Position	Any
Ultor● Terminal	Metal-Shell Lip
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



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

GRID-DRIVE▲ SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR● VOLTAGE	18000 max.	volts

●,▲: See next page.

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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

Equipment Design Ranges:

With any ultor voltage (E_{c3k}) between 16000 and 18000 volts and grid-No.2 voltage (E_{c2k}) between 200 and 500 volts*

Grid-No.1 Voltage for Visual Extinction of Focused Raster	12.3% to 24.3% of E_{c2k}	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak positive)	12.3% to 24.3% of E_{c2k}	volts
Grid-No.2 Current	−15 to +15	μamp
Focusing-Coil Current (DC)[oo]	$\left[\sqrt{\frac{E_{c3k}}{16000}} \times 110\right] \pm 10\%$	ma
Field Strength of Single-Field Ion-Trap Magnet (Approx.)	$\sqrt{\frac{E_{c3k}}{16000}} \times 50$	gausses
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Examples of Use of Design Ranges:

With ultor voltage (E_{c3k}) of	*16000*	*16000*	*volts*
and grid-No. voltage (E_{c2k}) of	*300*	*400*	*volts*
Grid-No.1 Voltage for Visual Extinction of Focused Raster	−37 to −73	−49 to −97	volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak positive)	37 to 73	49 to 97	volts
Focusing-Coil Current (DC)	110 ± 10%	110 ± 10%	ma
Ion-Trap Magnet (Rated Strength)	50	50	gausses

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

●,*,oo: See next page.

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Maximum Circuit Values:

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

CATHODE-DRIVE[■] SERVICE

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

Maximum Ratings, *Design-Center Values:*

ULTOR[●]-TO-GRID-No.1 VOLTAGE	18000 max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	625 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE	500 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:		
Positive bias value	125 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_{c3g1}) between 16000[♦] and 18000 volts and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) between 220 and 620 volts

Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	11% to 19.7% of E_{c2g1}	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak negative)	11% to 19.7% of E_{c2g1}	volts
Grid-No.2 Current	-15 to +15	µamp
Focusing-Coil Current (DC)[○○] .	$\left[\sqrt{\frac{E_{c3g1}}{16000}} \times 110\right] \pm 10\%$	ma

● 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 27MP4, the ultor function is performed by grid No.3. Since grid No.3 and collector are connected together within the 27MP4, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

■ 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.

♦ Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or the ultor-to-grid-No.1 voltage should not be less than 16000 volts.

○○: See next page.

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Field Strength of Single-Field Ion-Trap Magnet (Approx.) . .	$\sqrt{\frac{E_{c3g1}}{16000}} \times 50$		gausses
Field Strength of Adjustable Centering Magnet	0 to 8		gausses
Examples of Use of Design Ranges:			
With ultor-to-grid-No.1 voltage (E_{c3g1}) of	*16000*	*16000*	*volts*
and grid-No.2-to-grid-No.1 voltage (E_{c2g1}) of	*300*	*400*	*volts*
Cathode-to-Grid-No.1 Voltage for Visual Extinction of Focused Raster	33 to 59	44 to 79	volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level):			
White-level value (Peak negative)	-33 to -59	-44 to -79	volts
Focusing-Coil Current (DC) . .	110 ± 10%	110 ± 10%	ma
Ion-Trap Magnet (Rated Strength)	50	50	gausses

Maximum Circuit Values:

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

oo For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (see *Dimensional Outline*). The indicated current is for condition with combined bias voltage and video signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 23-7/16" x 18-1/8" picture area sharply focused at center of screen.

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

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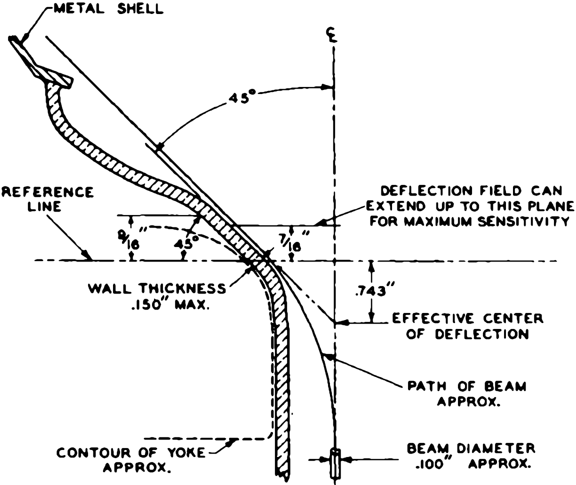
Shape of Neck-Funnel Section with Indication of Recommended Approximate Inside Contour of Yoke Based on Dimensions of Reference-Line Gauge (JETEC No.116) Shown at Front of this Section.



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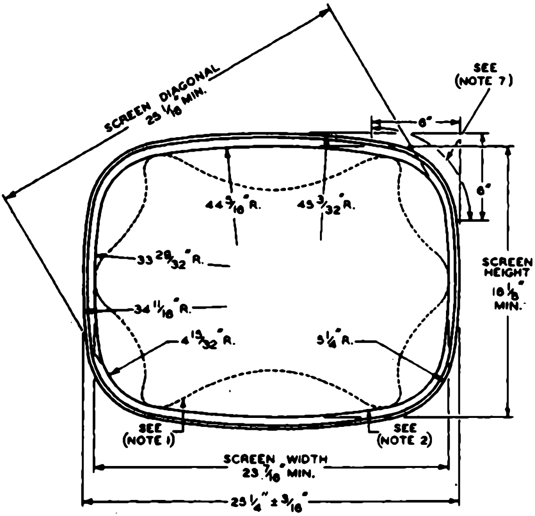

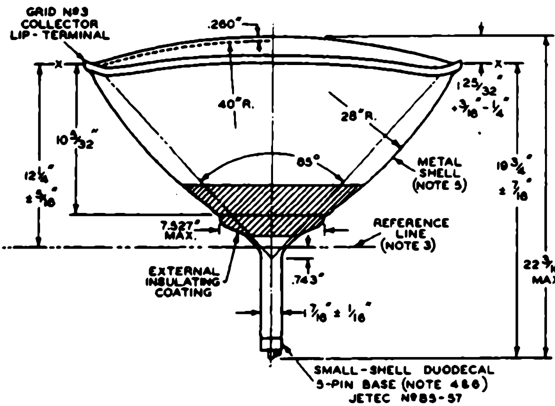

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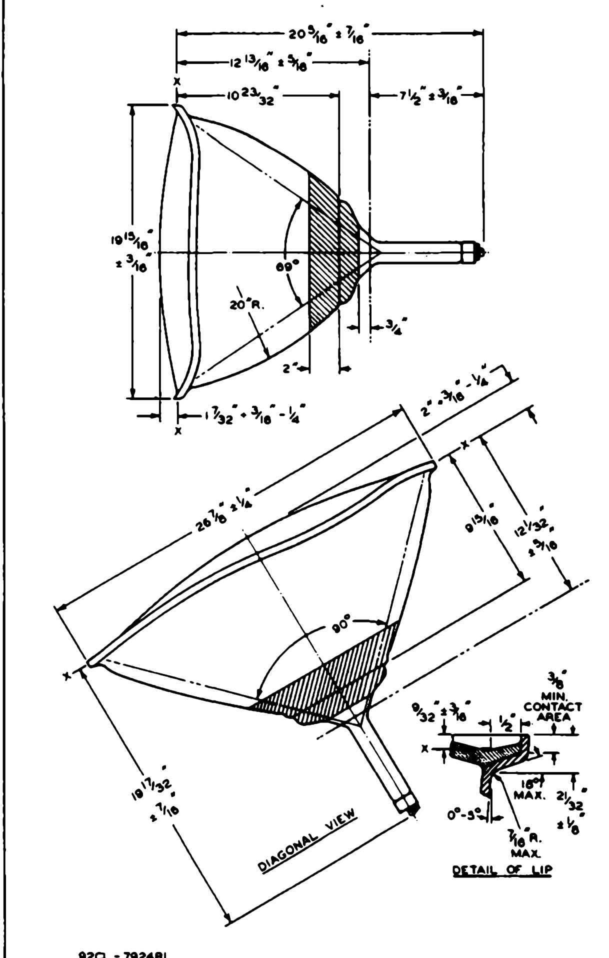

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NOTE 1: APPROXIMATE BOUNDARY OF SPHERICAL SURFACE HAVING 40" RADIUS. OUTSIDE THIS BOUNDARY, THE CURVATURE OF THE SURFACE IS BLENDED INTO THE RIM. (SEE NOTE 2).

NOTE 2: FACEPLATE SHAPE AT PERIMETER OF SCREEN CONFORMS TO SURFACE OF SPHERE HAVING 50" RADIUS.

NOTE 3: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 4: 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 3-1/4".

NOTE 5: 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.

NOTE 6: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE HORIZONTAL AXIS OF THE GLASS FACE BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°.

NOTE 7: SUPPORT TUBE IN LIP REGION ONLY AT CORNERS WITHIN THIS SPACE.

27MP4

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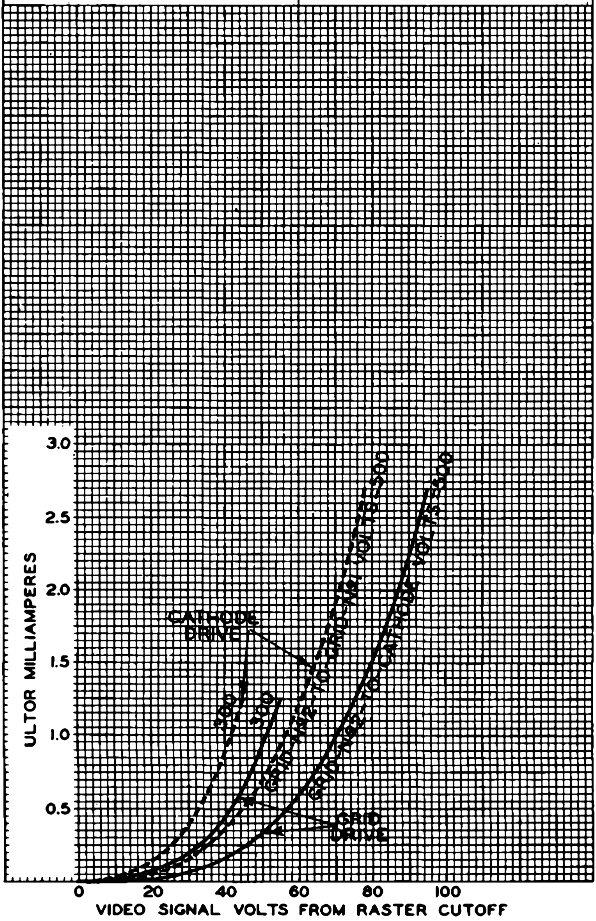
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS ULTOR-TO-GRID-No.1 VOLTS = 16000 TO 18000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF	E_f = 6.3 VOLTS ULTOR VOLTS = 16000 TO 18000 GRID No.1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF

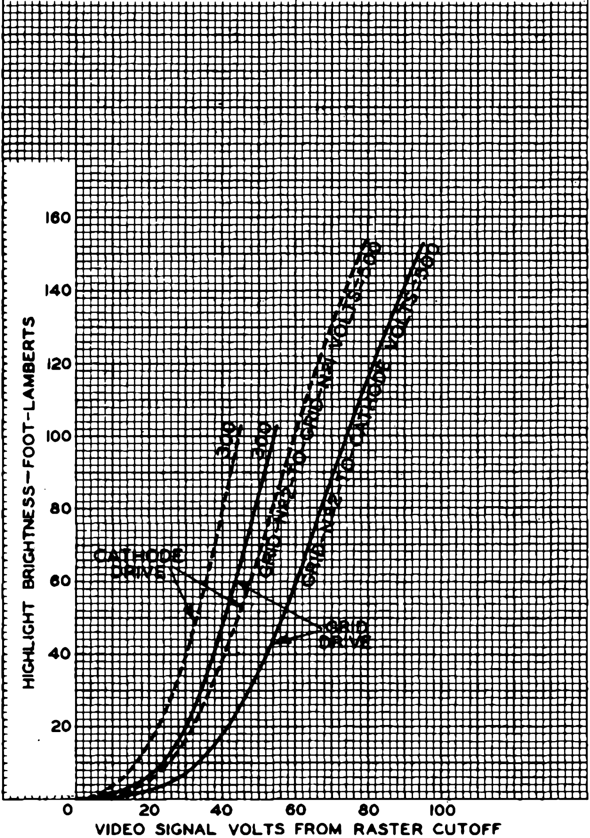


27MP4

27MP4

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=23 7/16" x 18 1/8"	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=23 7/16" x 18 1/8"



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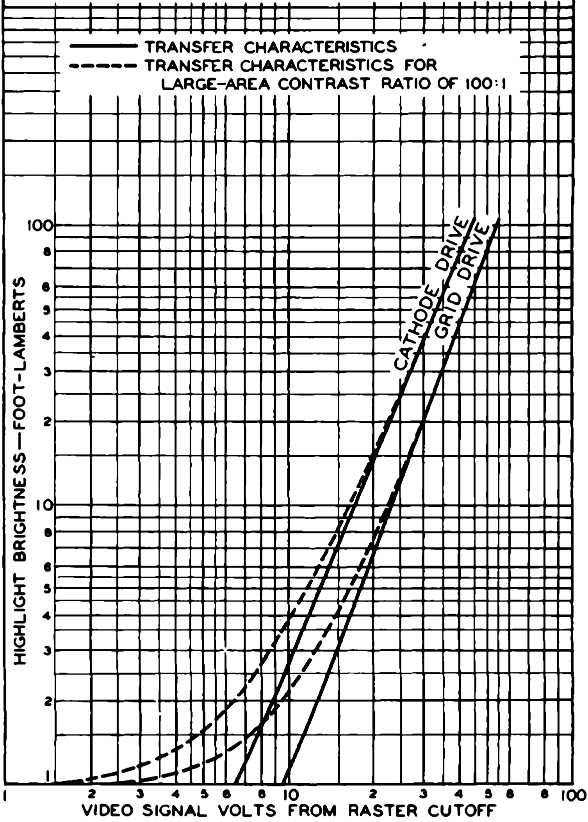
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-Nº1 VOLTS=16000	ULTOR VOLTS=16000
GRID-Nº2-TO-GRID-Nº1 VOLTS =300	GRID-Nº2-TO-CATHODE VOLTS =300
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: 23 7/16" x 18 1/8"	RASTER SIZE: 23 7/16" x 18 1/8"



902-A

HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 902

General:

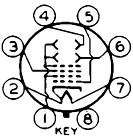
Heater, for Unipotential Cathode:
- Voltage . . . . 6.3 ± *10%* . . . . ac or dc volts
- Current . . . . 0.6 . . . . amp.

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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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

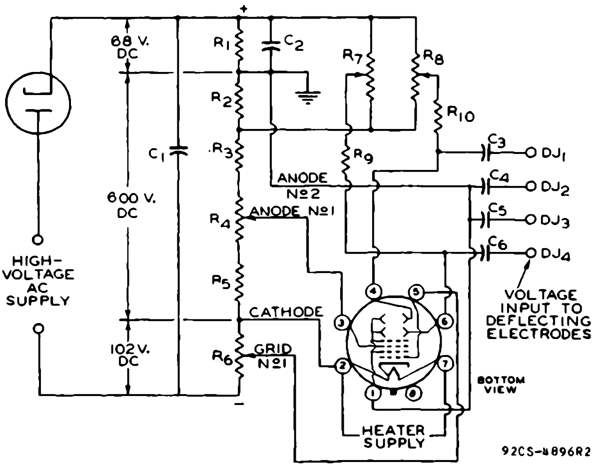
▲▲ It is recommended that both deflecting-electrode-circuit resistances be approximately equal.

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

902-A

HIGH-VACUUM CATHODE-RAY TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



92CS-4896R2

C1: 0.1 µf
C2: 1.0 µf
C3 C4 C5 C6: 0.05-µf Blocking Capacitors *
R1 R2: 1.0 Megohm
R3: 1.3 Megohms
R4: 1-Megohm Potentiometer
R5: 0.3 Megohm
R6: 0.5-Megohm Potentiometer
R7 R8: Dual 2-Megohm Potentiometer
R9 R10: 2 Megohms

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

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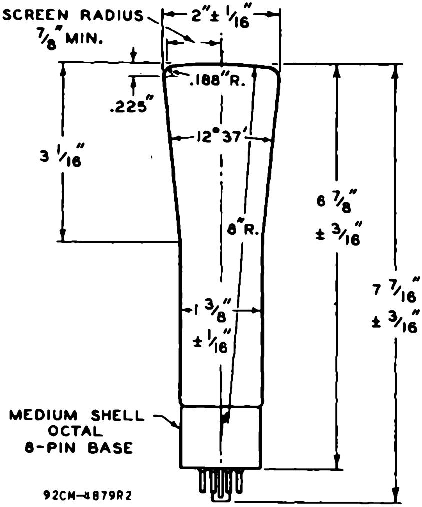
HIGH-VACUUM CATHODE-RAY TUBE



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

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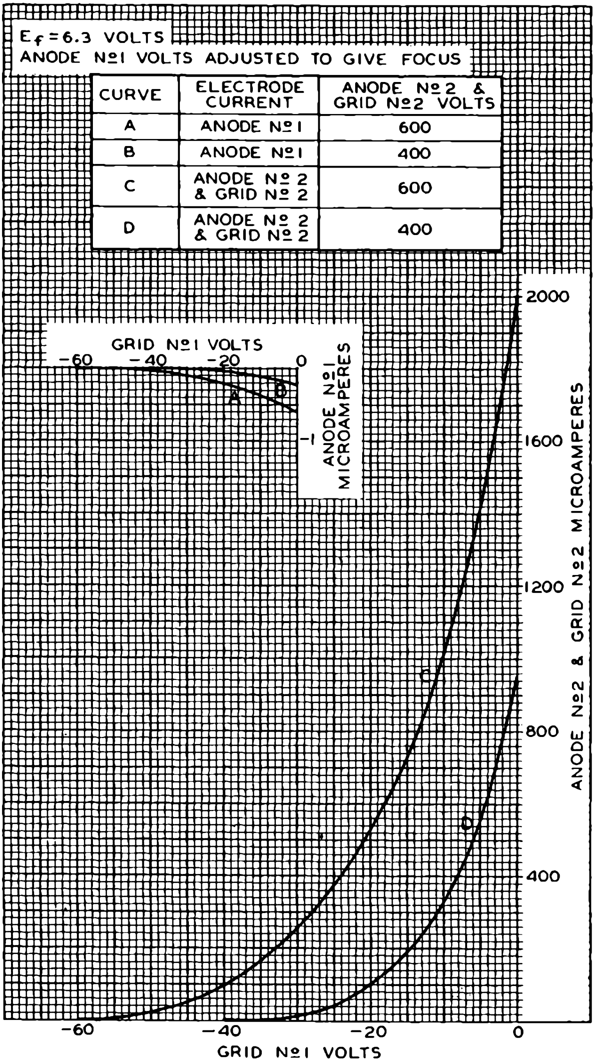
AVERAGE CHARACTERISTICS

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

CURVE	ELECTRODE CURRENT	ANODE No 2 & GRID No 2 VOLTS
A	ANODE No 1	600
B	ANODE No 1	400
C	ANODE No 2 & GRID No 2	600
D	ANODE No 2 & GRID No 2	400



RCA

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OSCILLOGRAPH TUBE

Supersedes Type 908

General:

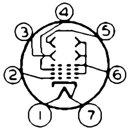
Heater, for Unipotential Cathode:
- Voltage . . . . 2.5 ± 10% . . . . ac or dc volts
- Current . . . . 2.1 . . . . amp.

Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to All Other Electrodes . . . . 9.0 . . μμf
- DJ_1 to All Other Electrodes . . . . 8.5 . . μμf
- DJ_3 to All Other Electrodes . . . . 6.5 . . μμf

Phosphor (For Curves, see front of this Section) . . . No.5
- Fluorescence . . . . Blue
- Persistence . . . . Very Short

Focusing Method . . . . Electrostatic
Deflection Method . . . . Electrostatic
Overall Length . . . . 11-1/2" ± 3/8"
Greatest Diameter of Bulb . . . . 3" ± 1/16"
Minimum Useful Screen Diameter . . . . 2-3/4"
Mounting Position . . . . Any
Base . . . . Medium 7-Pin
- Basing Designation for BOTTOM VIEW 7CE

Pin 1 – Heater
Pin 2 – Grid No.1
Pin 3 – Deflecting Electrode DJ_3
Pin 4 – Anode No.1
Pin 5 – Deflecting Electrode DJ_1



Pin 6 – Grid No.2, Anode No.2, Deflecting Electr. DJ_2, Deflecting Electr. DJ_4
Pin 7 – Heater, Cathode

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

With DJ_2 positive with respect to DJ_1, the spot is deflected toward pin 1. With DJ_4 positive with respect to DJ_3, the spot is deflected toward pin 6.

The angle between the trace produced by DJ_3 and DJ_4 and its intersection with the plane through the tube axis and pin 6 does not exceed 10°.

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

Maximum Ratings, *Design-Center Values:*

ANODE-No.2 & GRID No.2 VOLTAGE	1500 *max.*	volts
ANODE-No.1 VOLTAGE	1000 *max.*	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
Negative Value	125 *max.*	volts
Positive Value	0 *max.*	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND DEFLECTING ELECTRODE DJ_1 OR DJ_3	500 *max.*	volts

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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OSCILLOGRAPH TUBE

(continued from preceding page)

Typical Operation:

Anode No.2 & Grid No.2 Voltage* . .	1000	1500 . . .	volts
Anode No.1 Voltage for Focus at 75% of Grid-No.1 Voltage for Cutoff● . .	287	430 . . .	volts
Grid-No.1 Volt. for Visual Cutoff#.	-33	-50 . . .	volts
Max. Anode-No.1 Current Range▲.	Between -50 and +10		μamp.
Deflection Sensitivity:			
DJ1 and DJ2	0.334	0.223 . .	mm/v dc
DJ3 and DJ4	0.348	0.233 . .	mm/v dc
Deflection Factor:**			
DJ1 and DJ2	76	114 . .	v dc/in.
DJ3 and DJ4	73	109 . .	v dc/in.

* Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 1000 volts.

● Individual tubes may require between +29% and -44% of the values shown with grid-No.1 voltages between zero and cutoff.

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

▲ See curve for average values.

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

Spot Position:

The undeflected focused spot will fall within a 15-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ1 and DJ2. Suitable test conditions are: anode-No.2 voltage, 1500 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, 1 megohm each for DJ1 and DJ3, 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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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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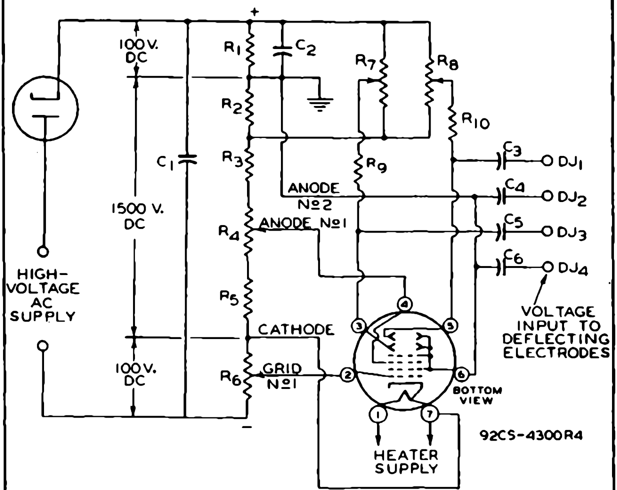
OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.1 µf
C2: 1.0 µf
C3 C4 C5 C6: 0.05-µf Blocking Capacitors*
R1 R2: 1.5 Megohms
R3: 4 Megohms
R4: 2-Megohm Potentiometer
R5: 1.0 Megohm
R6: 0.5-Megohm Potentiometer
R7 R8: Dual 3-Megohm Potentiometer
R9 R10: 2-Megohms

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

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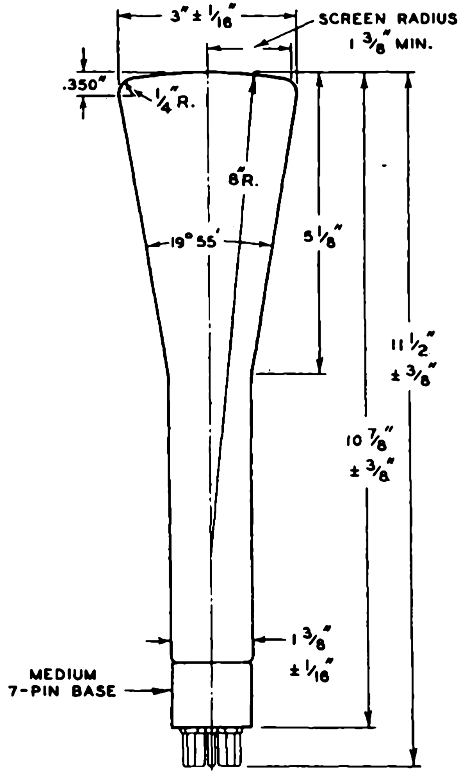
OSCILLOGRAPH TUBE



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

908-A

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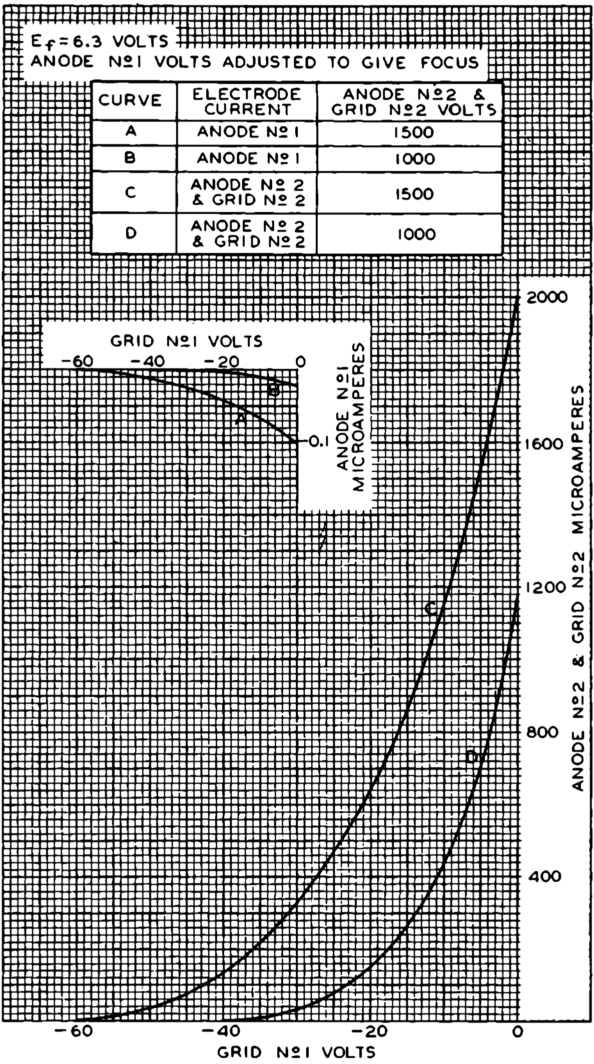
AVERAGE CHARACTERISTICS



CURVE	ELECTRODE CURRENT	ANODE Nº2 & GRID Nº2 VOLTS
A	ANODE Nº1	1500
B	ANODE Nº1	1000
C	ANODE Nº2 & GRID Nº2	1500
D	ANODE Nº2 & GRID Nº2	1000

912

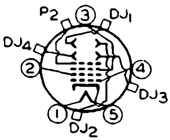
HIGH-VACUUM CATHODE-RAY TUBE

HIGH-INTENSITY ELECTROSTATIC-DEFLECTION TYPE
WITH 5" MEDIUM-PERSISTENCE SCREEN FOR OSCILLOGRAPHIC USE

Heater	Coated Unipotential Cathode	
Voltage	2.5	a-c or d-c volts
Current	2.1	amp.
Fluorescent Screen:		
Material		Phosphor No.1
Pattern Color		Greenish
Direct Interelectrode Capacitances:		
Grid to all other electrodes	14 max.	μμf
DJ_1 to DJ_2	3 max.	μμf
DJ_3 to DJ_4	1.5 max.	μμf
Overall Length		16-1/2" ± 3/8"
Maximum Diameter		5-1/4" + 1/16" - 3/32"
Bulb		J-42
Caps:		
Anode No.2		Medium Metal
Deflecting Electrodes (Four)		Small Metal
Base		Medium 5-Pin Micanol ←

BOTTOM VIEW

Pin 1 - Heater
Pin 2 - Grid No.2
Pin 3 - Anode No.1
Pin 4 - Grid No.1
Pin 5 - Heater, Cathode
Single Medium Cap - Anode No.2
Cap Over Pin 3 — Deflecting Electrode DJ_1



Cap Over Pins 1 & 5 — Deflecting Electrode DJ_2
Cap Over Pin 2 — Deflecting Electrode DJ_3
Cap Over Pin 4 — Deflecting Electrode DJ_4

MAXIMUM RATINGS and TYPICAL OPERATING CONDITIONS

Maximum Ratings Are Based on a Line-Voltage Design Center of 117 Volts

High-Voltage Electrode (Anode #2) Voltage	15000 max.	volts
Focusing Electrode (Anode #1) Voltage	4500 max.	volts
Accelerating Electrode (Grid #2) Voltage	250 max.	volts
Control Electrode (Grid #1) Voltage	Never positive	
Grid Voltage for Current Cut-off *	-125 approx.	volts
Peak Voltage Between Anode #2 and any deflecting electrode	7000 max.	volts

Typical Operation:

Heater Voltage	2.5	2.5	2.5	volts
Anode #2 Voltage	5000	10000	15000	volts
Anode #1 Voltage	1000	2000	3000	approx. volts
Grid #2 Voltage	250	250	250	volts
Grid #1 Voltage	Adjusted to give suitable luminous spot			
Deflection Sensitivity:				
DJ_1 to DJ_2	0.083	0.041	0.028	mm/volt d.c.
DJ_3 to DJ_4	0.102	0.051	0.034	mm/volt d.c.

* With maximum voltages on Anode #1 and Grid #2.

← Indicates a change.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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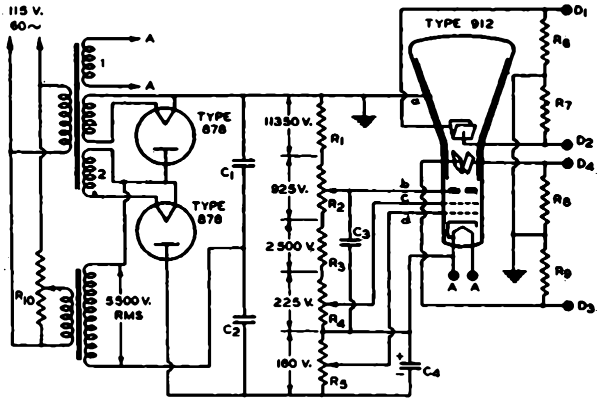
TYPICAL OSCILLOGRAPH CIRCUIT USING THE 912 WITH VOLTAGE-DOUBLING POWER SUPPLY



C_1, C_2 = 0.5 μf, 10000 V.	R_3 = 0.55 MEGOHM, 20-WATT	a = ANODE No.2
C_3 = 1.0 μf, 5000 V.	R_4 = 50000 OHMS, 2-WATT	b = ANODE No.1
C_4 = 16 μf, 200 V.	R_5 = 35000 OHMS, 2-WATT	c = GRID No.2
← R_1 = 2.5 MEGOHMS, 75-WATT	R_6, R_7, R_8, R_9 = 2 TO 5 MEGOHMS	d = GRID No.1
R_2 = 0.2 MEGOHM, 10-WATT	R_{10} = 100 OHMS, 600-WATT	

NOTE: AS THE TOTAL VOLTAGE ACROSS THE BLEEDER IS REDUCED BY MEANS OF R_{10}. THE ELECTRODE VOLTAGES ARE REDUCED IN CORRECT PROPORTION, EXCEPT FOR GRID NO.2 VOLTAGE; THIS MAY HAVE TO BE READJUSTED BY THE USE OF DIFFERENT VALUES FOR R_3 AND R_4. THEIR TOTAL RESISTANCE BEING KEPT THE SAME. CONDENSERS C_3 AND C_4 CAN BE OMITTED IF GRID-VOLTAGE SWITCHING (FOR HIGH-SPEED PHOTOGRAPHY) IS NOT CONTEMPLATED. FILAMENT WINDINGS NOS. 1 and 2 SHOULD BE INSULATED FOR 20000 VOLTS.

92C-4621R1

FLUORESCENT-SCREEN CHARACTERISTICS

CURVES SHOWING THE AVERAGE CHARACTERISTICS, SPECTRAL ENERGY CHARACTERISTIC, AND PERSISTENCE CHARACTERISTIC OF PHOSPHOR No.1 ARE SHOWN AT THE BEGINNING OF THIS SECTION.

← Indicates a change.

RCA

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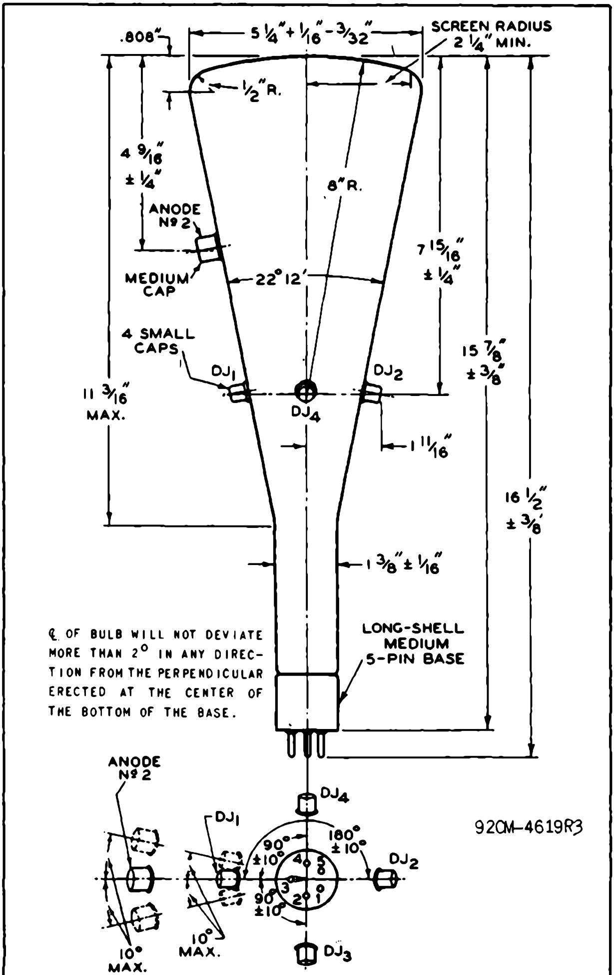
HIGH-VACUUM CATHODE-RAY TUBE



BOTTOM VIEW OF TUBE

DJ_1 AND DJ_2 ARE NEARER THE SCREEN; DJ_3 AND DJ_4 ARE NEARER THE BASE. ANGLE BETWEEN $DJ_1 - DJ_2$ TRACE AND $DJ_3 - DJ_4$ TRACE IS $90° \pm 6°$.

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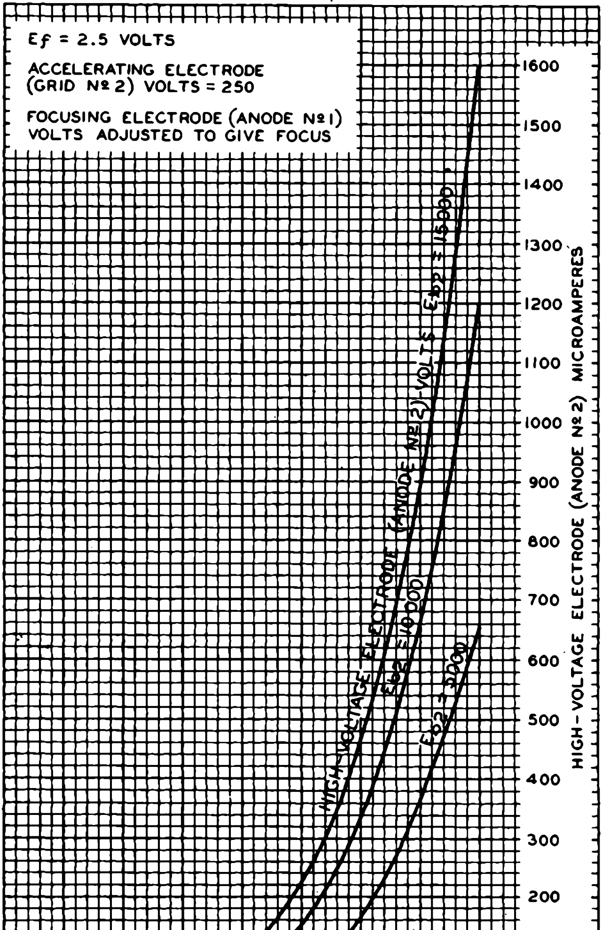
AVERAGE CHARACTERISTICS



AUG. 23, 1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92C-4623

913

913

HIGH-VACUUM CATHODE-RAY TUBE

Heater	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.6	amp.
Focus		Electrostatic ←
Deflection		Electrostatic ←
Electrodes DJ_1 and DJ_2 (upper): nearest to screen		
Electrodes DJ_3 and DJ_4 (lower): nearest to base		
DJ_1 is on the same side of tube as pins No.2 and No.4		
DJ_3 is on the same side of tube as pins No.2 and No.8		
Phosphor		No.1
Fluorescence		Green ←
Persistence		Medium
Direct Interelectrode Capacitances:		
Control Electrode (Grid) 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
Maximum Overall Length		4-3/4"
Maximum Diameter		1-5/8" ←
Bulb		Metal Shell, MT-10
Base		Small Wafer Octal 8-Pin ←

MAXIMUM RATINGS and TYPICAL OPERATING CONDITIONS

Maximum Ratings Are Based on a Line-Voltage Design Center of 117 Volts ←

High-Voltage Electrode (Anode No.2) Volt.		500 max.	volts
Focusing Electrode (Anode No.1) Volt.		200 max.	volts ←
Control Electrode (Grid) Volt.		Never positive	
Peak Voltage Between Anode No.2 and Any Deflecting Electrode		250 max.	volts
Grid Circuit Resistance		1.5 max.	megohms ←
Impedance of Any Deflecting-Electrode Circuit at Heater-Supply Frequency		1.0 max.	megohm ←
Typical Operation:			
Anode No.2 Voltage	250	500	volts
Anode No.1 Voltage □	50	100	approx. volts
Grid Voltage ○	Adjusted to give suitable luminous spot		
Deflection Sensitivity:			
Electrodes DJ_1 & DJ_2	0.15	0.07	mm/volt d.c.
Electrodes DJ_3 & DJ_4	0.21	0.10	mm/volt d.c.

NOTE 1: Brilliance and definition decrease with decreasing anode voltages. In general the anode No.2 voltage should not be less than 250 volts. ←

NOTE 2: The d-c potential of each deflecting electrode is maintained essentially equivalent to that of anode No.2 by connecting resistors having values not greater than 10 megohms between each deflecting electrode and anode No.2. This arrangement by suitable choice of resistor values minimizes pattern distortion and pattern drift resulting from unbalanced potentials on the deflecting electrodes. The smaller the resistor values, the less the distortion for a given beam current. ←

□, ○: See next page.

← Indicates a change.

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

913

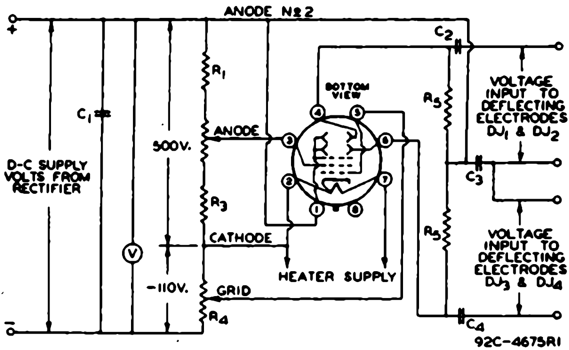
HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

→ ᵃ Supply should be adjustable to ± 30% of the value shown.
→ ᵒ Approximately 80% of Anode No.1 voltage is required for current cut-off when, in some applications, it is necessary to use the maximum permissible grid-circuit resistance.

Characteristic Curves of phosphor No.1 are shown at the beginning of this section.

TYPICAL OSCILLOGRAPH CIRCUIT



C_1 = FILTER CONDENSER
C_2, C_3, C_4 = SEE NOTE 3
$R_1 + R_2 + R_3 + R_4$ = BLEEDER POTENTIOMETER
R_1 = 0.200 MEGOHM
R_2 = 0.050 MEGOHM
R_3 = 0.030 MEGOHM
R_4 = 0.050 MEGOHM
R_5 = SEE NOTE 2 AT END OF DATA
V = VOLTMETER

NOTE 3: When the cathode or the negative end of the cathode-ray high-voltage supply is grounded, blocking condensers C_2, C_3, and C_4 should have a high voltage rating. When anode No.2 is grounded, C_3 may be omitted and C_2 and C_4 may be low-voltage condensers.

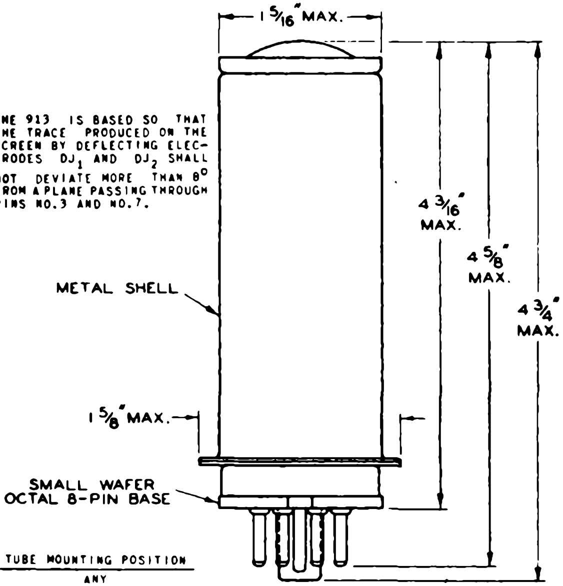
For d-c amplifier service, the deflecting electrodes should be coupled direct to the output of the amplifier by omitting the blocking condensers. In addition, it will usually be preferably to remove the associated deflecting electrode resistor in order to minimize the loading effect of the resistor on the d-c amplifier. With the resistor removed, it is essential, in order to minimize spot defocusing, that anode No.2 be returned to some point in the d-c amplifier circuit such that the potential difference between anode No.2 and the average voltage across the deflecting electrodes will be as low as possible.

← Indicates a change.

913

HIGH-VACUUM CATHODE-RAY TUBE

THE 913 IS BASED SO THAT THE TRACE PRODUCED ON THE SCREEN BY DEFLECTING ELECTRODES DJ_1 AND DJ_2 SHALL NOT DEVIATE MORE THAN 8° FROM A PLANE PASSING THROUGH PINS NO.3 AND NO.7.

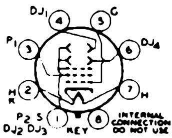


TUBE MOUNTING POSITION

ANY

BOTTOM VIEW OF SOCKET CONNECTIONS

DJ_1 to DJ_4 = Deflecting Electrodes
P_2 = Anode No.2
P_1 = Anode No.1
G_2 = Grid No.2
G_1 = Control (Grid No.1) Electrodes
H = Heater
K = Cathode
S = Shell
NC = No Connection



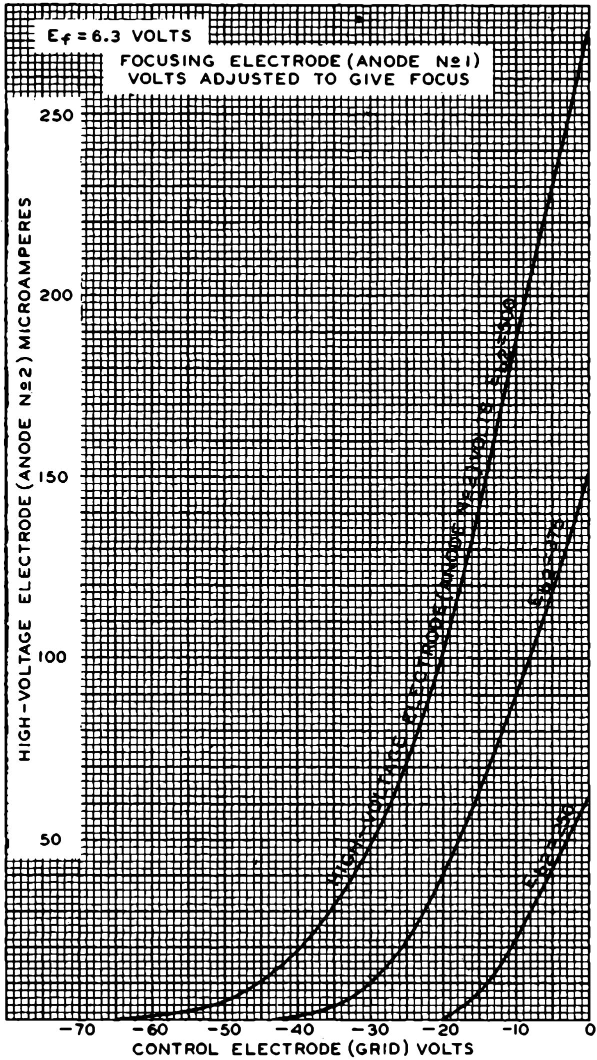
Jan. 30, 1942

92C-4679R2

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY INC

913

913
AVERAGE CHARACTERISTICS



OCT. 20, 1936

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

92C-4680

RCA

914-A

OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:
- Voltage . . . . 2.5 . . . . . . ac or dc volts
- Current . . . . 2.1 . . . . amp

Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to All Other Electrodes . . . 10.5 . . . . $\mu\mu f$
- DJ_1 to DJ_2 . . . . 2.0 . . . . $\mu\mu f$
- DJ_3 to DJ_4 . . . . 1.0 . . . . $\mu\mu f$

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

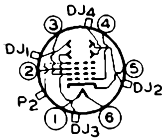
Focusing Method . . . . Electrostatic
Deflection Method . . . . Electrostatic
Overall Length . . . . 20-1/16" ± 3/8"
Greatest Diameter of Bulb . . . . 9-1/4" ± 1/8"
Minimum Useful Screen Diameter . . . . 8-1/4"
Mounting Position . . . . Any

Caps:
- Anode No.2 . . . . Medium
- Deflecting Electrodes (Four) . . . . Small

Base . . . . Long Medium-Shell Small 6-Pin

BOTTOM VIEW

Pin 1 - Heater
Pin 2 - Anode No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.1
Pin 5 - Cathode
Pin 6 - Heater
Single Medium Cap - Anode No.2
Cap over Pin 2 - Deflecting Electrode DJ_1



Cap over Pin 5 - Deflecting Electrode DJ_2
Cap over Pins 1 & 6 - Deflecting Electrode DJ_3
Cap over Pins 3 & 4 - Deflecting Electrode DJ_4

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 2. With DJ_3 positive with respect to DJ_4, the spot is deflected toward pins 1 and 6.

The angle between the trace produced by DJ_1 and DJ_2 and its intersection with the plane through the tube axis and pin 2 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° ± 6°.

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

ANODE-No.2 VOLTAGE° . . . . 7000 max. volts
ANODE-No.1 VOLTAGE . . . . 1900 max. volts

° The product of anode-No.2 voltage and average anode-No.2 current should never exceed 6 watts.

914-A

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914-A

OSCILLOGRAPH TUBE

GRID No.2 VOLTAGE	300 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 VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE	3000 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	125 max.	volts

→ **Equipment Design Ranges:**

*For any anode-No.2 voltage (Eb_2) between 1500 and 7000 volts**

Anode-No.1 Voltage	15% to 26% of Eb_2	volts
Grid-No.2 Voltage	250	volts
Max. Grid-No.1 Voltage for Visual Cutoff	30% of Eb_2	volts
Max. Anode-No.1 Current Range	-15 to + 10	μamp
Deflection Factors:		
DJ_1 to DJ_2	38 to 54	v dc/in./kv of Eb_2
DJ_3 to DJ_4	30 to 44	v dc/in./kv of Eb_2

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

For Anode-No.2 Volt. of	*1500*	*2500*	*5000*	*7000*	*volts*
Anode-No.1 Voltage	225-390	375-650	750-1300	1050-1800	volts
Grid-No.2 Voltage	250	250	250	250	volts
Max. Grid-No.1 Volt. for Visual Cutoff	-75	-75	-75	-75	volts
Deflection Factors:					
DJ_1 to DJ_2	57-81	93-135	190-270	266-378	v dc/in
DJ_3 to DJ_4	45-66	75-110	150-220	210-308	v dc/in

Maximum Circuit Values:

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

→ **Minimum Circuit Values:**

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

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

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

→ Indicates a change.

OSCILLOGRAPH TUBE

capacitor should be as follows:

Grid-No.1-Circuit Resistance.	150 min.	ohms
Grid-No.2-Circuit Resistance.	330 min.	ohms
Anode-No.1-Circuit Resistance	2000 min.	ohms
Anode-No.2-Circuit Resistance	8200 min.	ohms

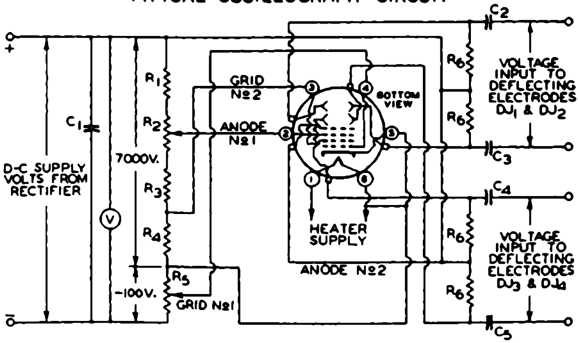
The resistors should be capable of withstanding the applied voltages.

914-A

914-A

OSCILLOGRAPH TUBE

TYPICAL OSCILLOGRAPH CIRCUIT



92CS-4754R3

C_1 = FILTER CAPACITOR 0.5 to 2.0 μf
C_2, C_3, C_4, C_5 = SEE NOTE
$R_1 + R_2 + R_3 + R_4 + R_5$ = BLEEDER POTENTIOMETER
R_1 = 2.5 MEGOHMS
R_2 = 0.5 MEGOHM
R_3 = 0.375 MEGOHM
R_4 = 0.125 MEGOHM
R_5 = 0.050 MEGOHM
R_6 = SEE □ ON BACK OF DATA 1
V = VOLTMETER

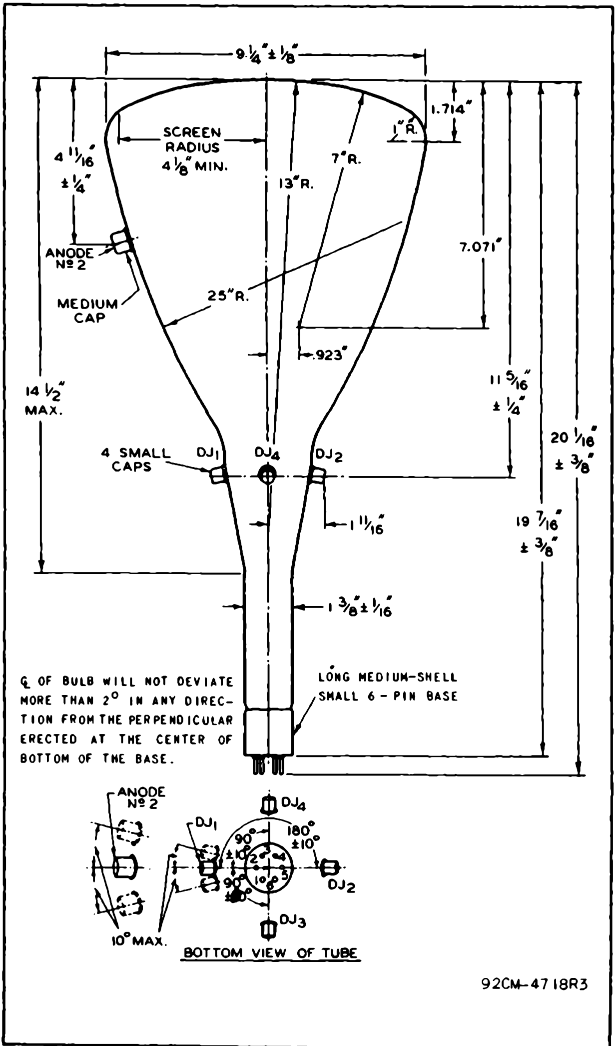
NOTE: When the cathode or the negative end of the cathode-ray high-voltage supply is grounded, blocking capacitors C_2, C_3, C_4, and C_5 should have a high voltage rating. When anode No.2 is grounded, C_2, C_3, C_4, and C_5 may be low-voltage capacitors.

For dc amplifier service, the deflecting electrodes should be coupled direct to the output of the amplifier by omitting the blocking capacitors. In addition, it will usually be preferable to remove the associated deflecting-electrode resistor in order to minimize the loading effect of the resistor on the dc amplifier. With the resistor removed, it is essential, in order to minimize spot defocusing, that anode No.2 be returned to some point in the dc amplifier circuit such that the potential difference between anode No.2 and the average voltage across the deflecting electrodes will be as low as possible.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

914-A
OSCILLOGRAPH TUBE



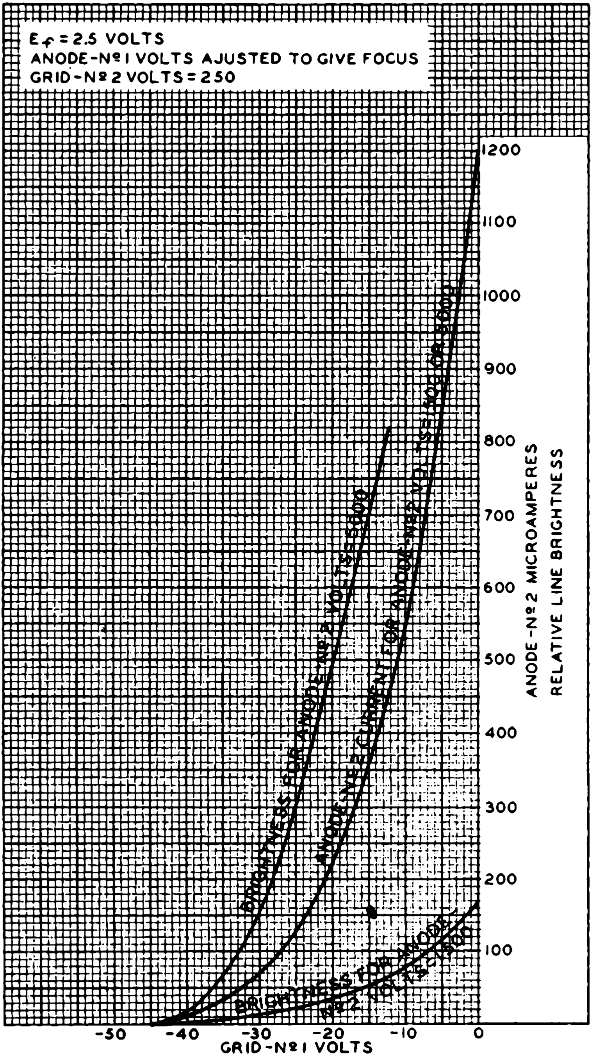
MAY 1, 1950

CE-4718R3

914-A

914-A

AVERAGE CHARACTERISTICS



JULY 19, 1946

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6785R1

1848

1848
ICONOSCOPE

For use in portable television cameras

Heater	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.6	amp.
Deflection		Magnetic
Type of Pickup		Direct
Direct Interelectrode Capacitance:		
Signal Plate to Collector & Anode No.2 (with external shielding)		10 approx. μμf
Control Grid to All Other Electrodes		12 max. μμf
Dimensions		See *Outline Drawing*
Caps (two)		Small Metal
Base		Dwarf Metal Shell Octal 8-Pin

MAXIMUM RATINGS and TYPICAL OPERATING CONDITIONS

High-Voltage Electrode (Anode No.2) & Collector Voltage	1200 max.■	volts
Accelerating Electrode (Grid No.2) Voltage	1200 max.■	volts
Focusing Electrode (Anode No.1) Voltage	400 max.■	volts
Control Electrode (Grid No.1) Voltage	Never Positive	
Grid No.1 Volt. for Current Cut-Off	-50 approx.	volts
Anode No.2 & Collector Current *	0.5 max.■	μamp.
Ambient Temperature	40 max.	°C
Typical Operation:		
Heater Voltage ○	6.3	volts
Anode No.2 & Collector Voltage	1000	volts
Grid No.2 Voltage	1000	volts
Anode No.1 Voltage ●	300 approx.	volts
Grid No.1 Voltage ▲ #	-40 approx.	volts
Anode No.2 & Collector Current *	0.1 approx.	μamp.

■ Design maximum for 117-volt line.
* When this current is measured, the mosaic should not be illuminated.
○ The cathode should be connected to one side or, preferably, to the mid-tap of the heater winding.
▲ Should be adjusted and set at largest negative value which will provide sufficient video output.
\# Maximum d-c resistance in the grid circuit should not exceed 1 megohm.
● Should be adjusted and set at value giving best focus.

NOTE: Signal plate-to-collector impedance is a function of bias light, image brilliance, and beam current, and is in the order of a few megohms for normal operation. Normal beam current is in the order of 0.25 microampere.

The signal-plate resistive load should be approximately one-tenth of the signal plate-to-collector impedance if constant signal output without phase shift is required in all frequencies of the picture signal.

A practical design value of signal-plate load impedance is in the order of 0.1 to 0.5 megohm. With low values of load resistance, gain and signal output-to-noise ratio are low. With high values, gain and signal output-to-noise ratio are increased. In either case, the low video frequencies are over-emphasized and must be equalized by a video stage having low low-frequency gain.

Signal output current varies with beam current, illumination level, and bias lighting, but is in the order of 0.15 microampere peak to peak. Good operation can be obtained with a highlight illumination level on the mosaic in the order of 7 foot-candles.

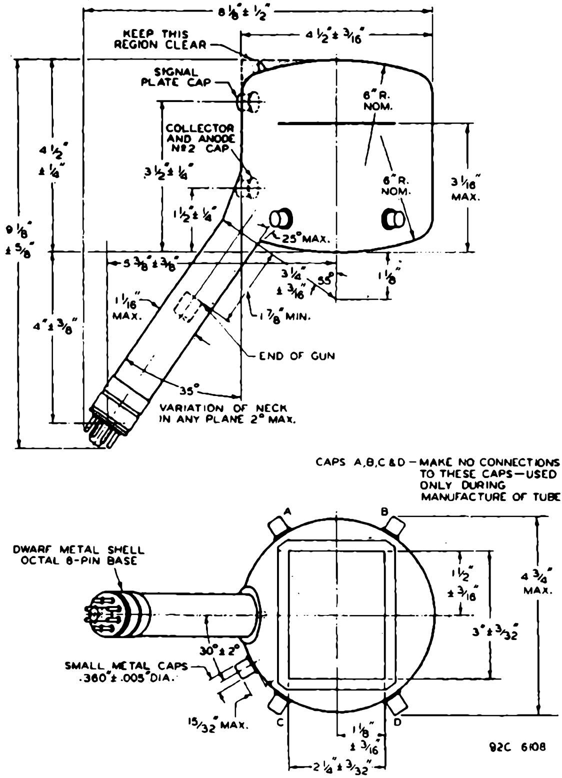
The spectral sensitivity of the 1848 is adjusted for outdoor pickup.

The d-c resistance in the signal-plate circuit should be limited to one megohm.

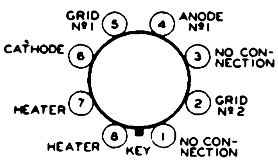
1848

1848

ICONOSCOPE



TOP VIEW OF SOCKET CONNECTIONS



TUBE MOUNTING POSITION

HORIZONTAL
VERTICAL: Base down

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

RCA

1850-A

ICONOSCOPE

FOR PICKUP FROM MOTION-PICTURE FILM OR SLIDES

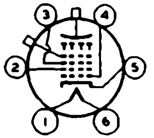
DATA

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	6.5	$\mu\mu$f	
Signal Electrode to Grid No.4°	10	$\mu\mu$f	
Mosaic, Photosensitive:			
Response		See Curve	
Useful Size of Rectangular Image (4 x 3 Aspect Ratio)		5.75" max. diagonal	←
Focusing Method		Electrostatic	
Deflection Method		Magnetic	
Deflection Angle (Approx.)		55°	←
Max. Width of Mounted Tube		8-1/8"	
Height of Mounted Tube		10-3/16" ± 3/4"	
Depth of Mounted Tube		12-13/16" ± 3/4"	
Mounting Position		Mosaic in vertical plane	
Minimum Deflecting-Coil Inside Diameter		1-1/2"	←
Maximum Deflecting-Coil Length		2-1/4"	←
Caps (Two)		Medium (JETEC No.C1-5)	
Base		Long Medium-Shell Small 6-Pin	

BOTTOM VIEW

Pin 1 - Heater
Pin 2 - Grid No.2
Pin 3 - Grid No.3
Pin 4 - Grid No.1
Pin 5 - Cathode
Pin 6 - Heater



DIRECTION OF LIGHT IS NORMAL TO MOSAIC

Caps { See Outline Drawing
S_J - Signal Electrode
G_4 - Grid No.4 (Collector)

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

AVERAGE MOSAIC ILLUMINATION●	50 max.	ft-c	←
OPERATING TEMPERATURE OF BULB AT LARGE END OF TUBE	40 max.	°C	←
SIGNAL-ELECTRODE VOLTAGE	1200 max.	volts	
GRID-No.4 (COLLECTOR) VOLTAGE	1200 max.	volts	
GRID-No.3 VOLTAGE	450 max.	volts	
GRID-No.2 VOLTAGE	1200 max.	volts	
GRID-No.1 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	10 max.	volts	
GRID-No.4 CURRENT	0.5 max.	μamp	

° With external shield.

● Averaged over any interval of 1 sec. max.

← Indicates a change.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1850-A

1850-A
ICONOSCOPE

Typical Operation and Characteristics:

Signal-Electrode Voltage	1000	volts
Grid-No.4 Voltage.	1000	volts
Grid-No.3 Voltage (Beam Focus)— 24% to 36% of Grid-No.4 Voltage. . . .	240 to 360	volts
Grid-No.2 Voltage.	1000	volts
→ Max. Grid-No.1 Voltage for Pattern Cutoff— 7% of Grid-No.4 Voltage . . .	-70	volts
→ Grid-No.4 Current (With no illumination on mosaic)*. . .	0.1 to 0.2	μamp
External Load Resistance	0.1	megohm
→ Illumination on Mosaic:		
Steady Highlight Value for Slides. . .	4 to 6	ft-c
Average Pulsed Highlight Value for Motion-Picture Film.	10 to 20	ft-c
→ Ratio of Peak-to-Peak Highlight Video-Signal Current to RMS Noise Current (Approx.). .	100	
→ Minimum Peak-to-Peak Blanking Voltage. .	20	volts
→ Deflecting-Coil Current (Approx.):**		
Horizontal (Peak to peak).	600	ma
Vertical (Peak to peak).	140	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.0 max.	megohm

* Allowance should be made for leakage currents.
** For RCA Deflecting Yoke No.201D76.

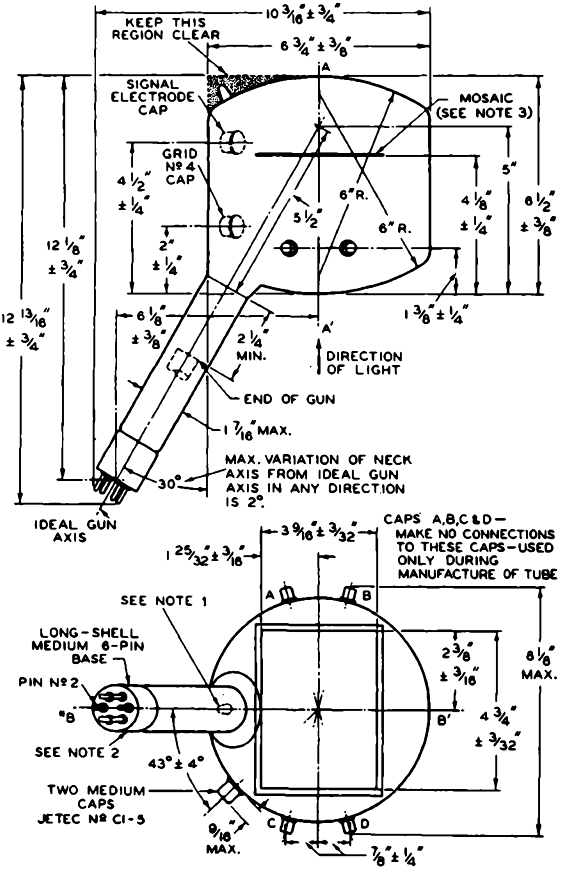
→ Indicates a change.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

1850-A

ICONOSCOPE



* BB' IS THE PLANE THROUGH THE BULB AXIS AA' AND THE IDEAL GUN AXIS.

← Indicates a change.

1850-A

ICONOSCOPE

NOTE 1: VARIATION OF TIP CENTER FROM PLANE BB' IS 1/2".

NOTE 2: MAXIMUM ROTATION OF LINE THROUGH PINS 2 AND 5 ABOUT IDEAL GUN AXIS IS ± 10°, MEASURED FROM PLANE BB'.

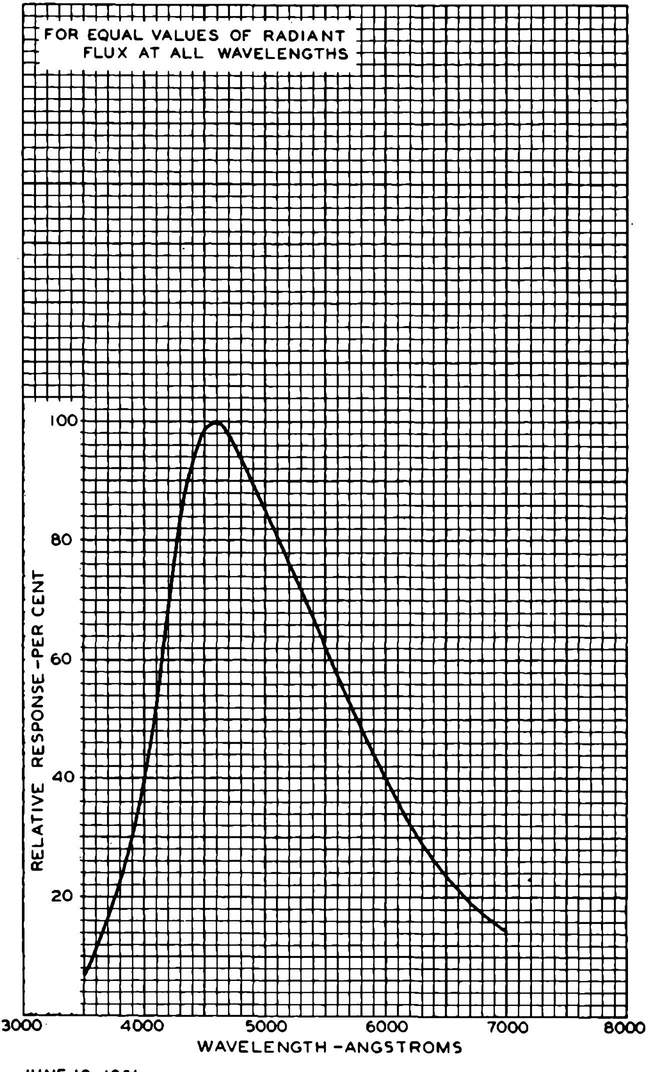
NOTE 3: DEVIATION OF PLANE OF MOSAIC FROM PLANE PERPENDICULAR TO THE BULB AXIS AA' IS 2.5° MAX. ROTATION OF MOSAIC ABOUT THE BULB AXIS AA' WITH RESPECT TO A LINE OF INTERSECTION FORMED BY MOSAIC PLANE AND PLANE BB' IS 2.5° MAX.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

1850-A

SPECTRAL SENSITIVITY CHARACTERISTIC



JUNE 18, 1951

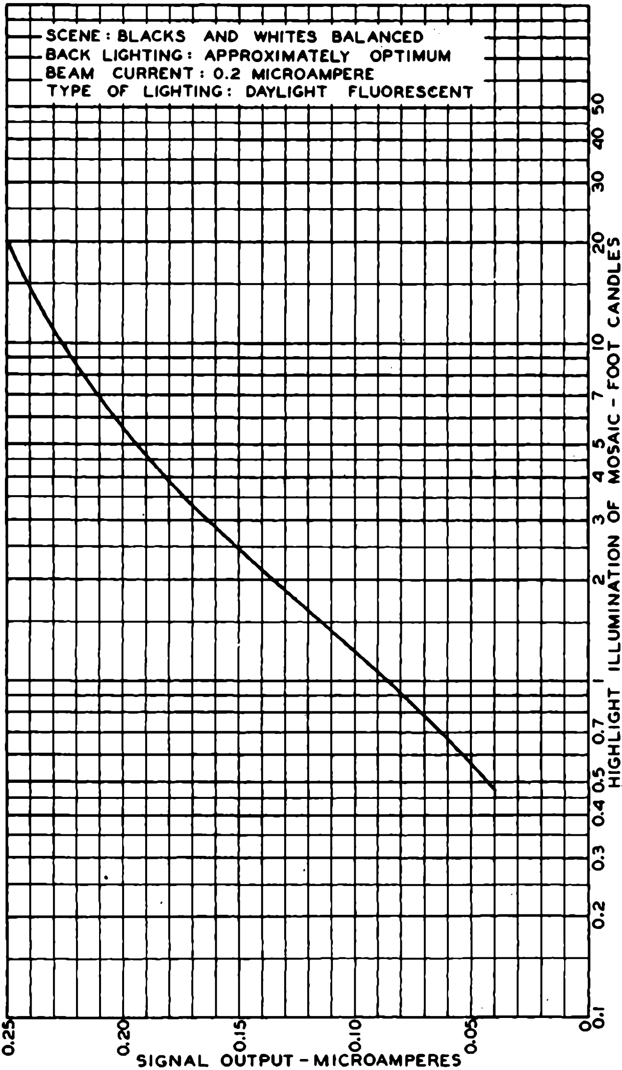
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6404R1

RCA

1850-A

TYPICAL SIGNAL-OUTPUT CHARACTERISTIC



JAN. 2, 1951 — TUBE DEPARTMENT — 92CM-6581R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

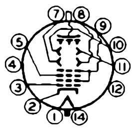
5527
ICONOSCOPE

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	7.5	$\mu\mu$f
Signal Electrode to All Other Electrodes and External Shield	5 . .	$\mu\mu$f
Focusing Method		Electrostatic
Deflection Method		Electrostatic
Image Size (4 x 3 aspect ratio)		1.4" Diagonal
Overall Length.		9" ± 1/4"
Seated Length		8-1/4" ± 1/4"
Maximum Diameter.		2-1/4"
Mounting Position		Any
Cap		Recessed Small Cavity
Base		Medium-Shell Diheptal 12-Pin
Basing Designation for BOTTOM VIEW		14L

Pin 1 - Heater
Pin 2 - Cathode
Pin 3 - Grid No.1
Pin 4 - Internal Connection - Do Not Use
Pin 5 - Grid No.3
Pin 7 - Deflecting Electrode DJ3
Pin 8 - Deflecting Electrode DJ4



DIRECTION OF LIGHT: INTO END OF BULB

Pin 9 - Anode No.2, Grid No.4
Pin 10 - Deflecting Electrode DJ2
Pin 11 - Deflecting Electrode DJ1
Pin 12 - Internal Connection- Do Not Use
Pin 14 - Heater
Cap - Signal Electrode

Maximum Ratings, *Design-Center Values*:

SIGNAL-ELECTRODE VOLTAGE.	900 max.	. . . volts
GRID-No.4 & GRID-No.2 VOLTAGE . . .	900 max.	. . . volts
GRID-No.3 VOLTAGE	450 max.	. . . volts
GRID-No.1 VOLTAGE:		
Negative bias value	100 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 . . .	10 max.	. . . volts
AMBIENT TEMPERATURE	40 max.	. . . °C
MOSAIC ILLUMINATION	50 max.	foot-candles

▲ With external shield.

5527

5527
ICONOSCOPE

Typical Operation:

Signal-Electrode Voltage	800	volts
Grid-No.4 & Grid-No.2 Voltage . . .	800	volts
Grid-No.3 Voltage for Focus . . .	125 to 250 . . .	volts
Grid-No.1 Voltage	Adjust for best picture	
Max. Grid-No.1 Voltage for Picture Cutoff . .	-75	volts
Max. Deflecting Voltages (Peak-to-Peak)*:		
DJ_1 & DJ_2 (Vertical)	120	volts
DJ_3 & DJ_4 (Horizontal)	100	volts
Min. Peak-to-Peak Blanking Voltage	30	volts
Signal-Output Current (Approx.) . .	0.025	μamp
Output Resistor (Approx.)	1.0	megohm

Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . .	1.0 max. . . .	megohm
Resistance in any Deflecting-Electrode Circuit□ . .	5.0 max. . . .	megohms

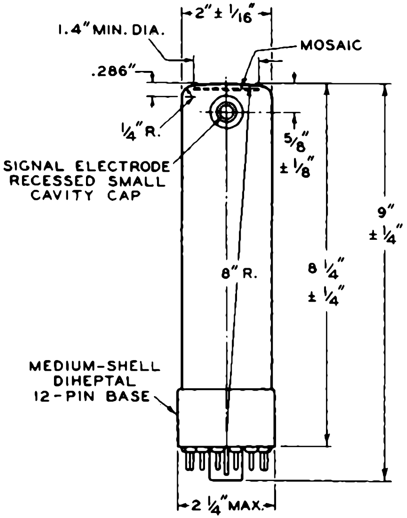
* To scan picture of 1.4" diagonal (4 x 3 aspect ratio).

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

The SPECTRAL SENSITIVITY CHARACTERISTIC curve for the 5527 is the same as that shown for Type 1850-A.

5527

ICONOSCOPE



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

THE PLANE THROUGH THE TUBE AXIS AND BASE-PLUG KEY MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND SIGNAL ELECTRODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 20°. SIGNAL ELECTRODE TERMINAL IS ON SAME SIDE AS BASE-PLUG KEY.

DJ1 AND DJ2 ARE NEARER THE MOSAIC; DJ3 AND DJ4 ARE NEARER THE BASE. WITH DJ1 POSITIVE WITH RESPECT TO DJ2, THE SPOT IS DEFLECTED TOWARD PIN 5. WITH DJ3 POSITIVE WITH RESPECT TO DJ4, THE SPOT IS DEFLECTED TOWARD PINS 1 AND 2. WITH DJ1 AND DJ2 USED FOR VERTICAL DEFLECTION, THE VERTICAL AXIS OF THE SCANNED AREA OF THE MOSAIC IS PARALLEL TO VERTICAL PLANE THROUGH PINS 5 AND 12 WITHIN ±15°. THE ANGLE BETWEEN THE SCANNING DIRECTION PRODUCED BY DJ3 AND DJ4 AND THE SCANNING DIRECTION PRODUCED BY DJ1 AND DJ2 IS 90° ± 3°.

92CS-6803

5655

5655
IMAGE ORTHICON

MAGNETIC FOCUS—MAGNETIC DEFLECTION

DATA

General:

Heater, for Unipotential Cathode:

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

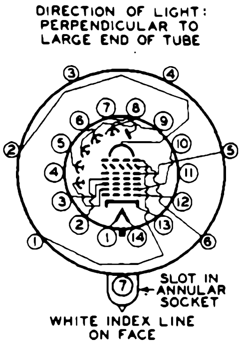
Direct Interelectrode Capacitance:

Anode to All Other Electrodes	20	μμf

Photocathode Spectral Response	See Curve
Image Size (4 x 3 aspect ratio)	1/6" Diagonal
Focusing Method	Magnetic
Deflection Method	Magnetic
Overall Length	15-1/4" ± 1/4"
Greatest Diameter of Bulb	3" ± 1/16"
Minimum Deflecting-Coil Inside Diameter	2-1/8"
Deflecting-Coil Length	5"
Focusing-Coil Length	10"
Alignment-Coil Length	15/16"
Photocathode Distance Inside End of Focusing Coil	1/2"
Operating Position	Any except with diheptal base up and tube axis at angle of less than 20° from the vertical
End Base	Small-Shell Diheptal 14-Pin

Pin 1 - Heater
Pin 2 - Grid No.4
Pin 3 - Grid No.3
Pin 4 - Internal Connection—Do Not Use
Pin 5 - Dynode No.2
Pin 6 - Dynode No.4
Pin 7 - Anode
Pin 8 - Dynode No.5
Pin 9 - Dynode No.3
Pin 10 - Dynode No.1, Grid No.2
Pin 11 - Internal Connection—Do Not Use
Pin 12 - Grid No.1
Pin 13 - Cathode
Pin 14 - Heater

BOTTOM VIEW



Shoulder Base . . . . Keyed Jumbo Annular 7-Pin

Pin 1 - Grid No.6
Pin 2 - Photocathode
Pin 3 - Internal Connection—Do Not Use
Pin 4 - Internal Connection—Do Not Use
Pin 5 - Grid No.5
Pin 6 - Target
Pin 7 - Internal Connection—Do Not Use

5655

5655
IMAGE ORTHICON

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

PHOTOCATHODE VOLTAGE	-550 max.	volts
PHOTOCATHODE ILLUMINATION.	50 max.	ft-c
OPERATING TEMPERATURE OF ANY PART OF BULB	65 max.	°C
OPERATING TEMPERATURE OF BULB AT LARGE END OF TUBE (Target Section) . . .	45 min.	°C
TEMPERATURE DIFFERENCE BETWEEN TARGET SECTION AND ANY PART OF BULB HOTTER THAN TARGET SECTION.	5 max.	°C
GRID-No.6 VOLTAGE.	-550 max.	volts
TARGET VOLTAGE:		
Positive value	50 max.	volts
Negative value	50 max.	volts
GRID-No.5 VOLTAGE	150 max.	volts
GRID-No.4 VOLTAGE	300 max.	volts
GRID-No.3 VOLTAGE	400 max.	volts
GRID-No.2 & DYNODE-No.1 VOLTAGE.	350 max.	volts
GRID-No.1 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	10 max.	volts
ANODE-SUPPLY VOLTAGE●	1500 max.	volts
VOLTAGE PER MULTIPLIER STAGE	350 max.	volts

Typical Operation:

Photocathode Voltage (Image Focus) . .	-300 to -500	volts
Grid-No.6 Voltage (Accelerator)— 80% of photocathode voltage.	-240 to -400	volts
Target Voltage●	0	volts
Grid-No.5 Voltage (Decelerator)●● . .	0 to 100	volts
Grid-No.4 Voltage (Beam Focus)	160 to 240	volts
Grid-No.3 Voltage##	225 to 330	volts
Grid-No.2 & Dynode-No.1 Voltage. . . .	300	volts
Grid-No.1 Voltage (For Picture Cutoff)	-35 to -100	volts
Dynode-No.2 Voltage.	600	volts
Dynode-No.3 Voltage.	800	volts
Dynode-No.4 Voltage.	1000	volts
Dynode-No.5 Voltage.	1200	volts
Anode Voltage.	1250	volts
Anode Current.	100	μa
Target Temperature Range	45 to 60	°C
Ratio of Peak-to-Peak Highlight Video-Signal Current to RMS Noise Current (Approx.). . . .	70	
Minimum Peak-to-Peak Blanking Voltage	10	volts
Field Strength at Center of Focusing Coil	75	gausses

●,●,●●,##: See next page.

5655
IMAGE ORTHICON

Focusing-Coil Current (Approx. for coil listed below)	75	ma
Deflecting-Coil Current (Approx. for assembly listed below):		
Horizontal (Peak to Peak).	625	ma
Vertical (Peak to Peak).	290	ma
Alignment-Coil Current (Approx. for coil listed below)	0 to 30	ma

Components:

Deflecting-Coil Assembly (Includes Keyed Jumbo Annular 7-Pin Socket). .	RCA Type No. 201D75
Focusing-Coil Assembly	RCA Type No. 202D75
Alignment-Coil Assembly	RCA Type No. 204D75
Hor. Deflection Output Transformer . .	RCA Type No. 204T1
Ver. Deflection Output Transformer . .	RCA Type No. 204T2

⊕ Ratio of dynode voltages is shown under Typical Operation.

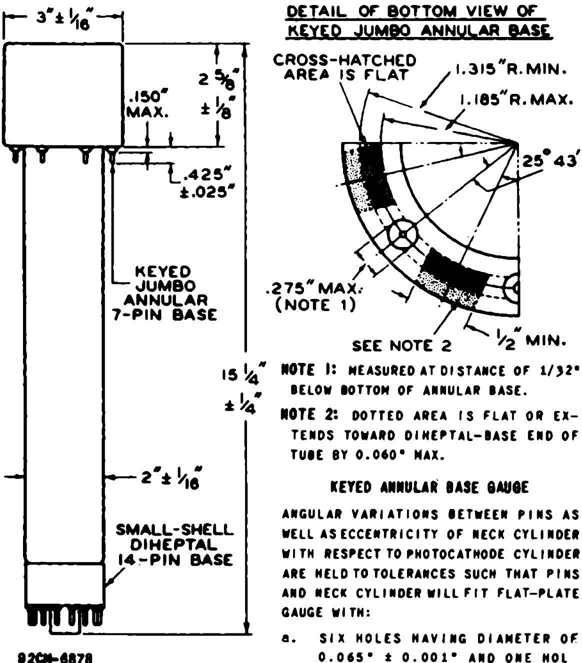
● Adjustable within ± 3 volts of indicated value, with blanking voltage off.

●● Taps at 0, 30, 60, and 90 volts are recommended. Set at voltage giving most uniform resolution and most uniform background shading over entire picture area.

Adjust to give the most uniformly shaded picture near maximum signal.

5655

5655
IMAGE ORTHICON



NOTE 1: MEASURED AT DISTANCE OF 1/32" BELOW BOTTOM OF ANNULAR BASE.

NOTE 2: DOTTED AREA IS FLAT OR EXTENDS TOWARD DIHEPTAL-BASE END OF TUBE BY 0.060" MAX.

KEYED ANNULAR BASE GAUGE

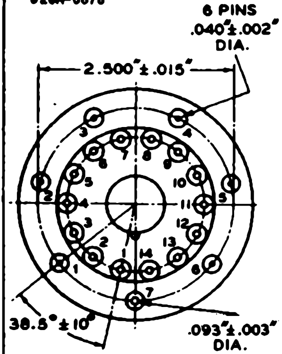
ANGULAR VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF NECK CYLINDER WITH RESPECT TO PHOTOCATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND NECK CYLINDER WILL FIT FLAT-PLATE GAUGE WITH:

a. SIX HOLES HAVING DIAMETER OF 0.065" ± 0.001" AND ONE HOL HAVING DIAMETER OF 0.150" ± 0.001". ALL HOLES HAVE DEPTH OF 0.265" ± 0.001". THE SIX 0.065" HOLES ARE ENLARGED BY 45° TAPER TO DEPTH OF 0.047". ALL HOLES ARE SPACED AT ANGLES OF 51°26' ± 5' ON CIRCLE DIAMETER OF 2.500" ± 0.001".

b. SIX STOPS HAVING HEIGHT OF 0.187" ± 0.001", CENTERED BETWEEN PIN HOLES, TO BEAR AGAINST FLAT AREAS OF BASE.

c. RIM EXTENDING OUT A MINIMUM OF 1/8" FROM 2-13/16" DIAMETER AND HAVING HEIGHT OF 0.126" ± 0.001".

d. NECK-CYLINDER CLEARANCE HOLE HAVING DIAMETER OF 2.200" ± 0.001".



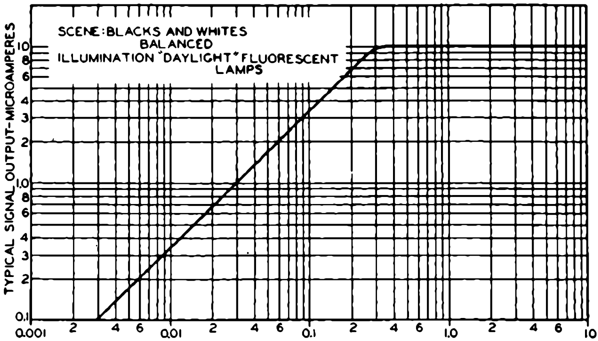
ENLARGED BOTTOM VIEW

5655

5655

CHARACTERISTIC CURVES

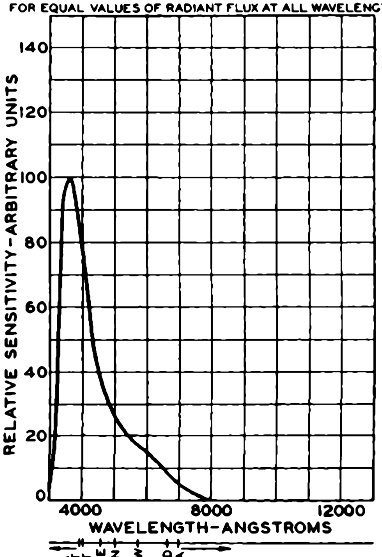
TYPICAL SIGNAL OUTPUT



92CM-6889TV

SPECTRAL SENSITIVITY CHARACTERISTIC

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



92CM-6877T

RCA

5769

IMAGE ORTHICON

MAGNETIC FOCUS MAGNETIC DEFLECTION

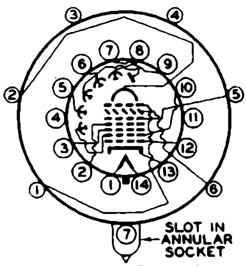
DATA

General:

Heater, for Unipotential Cathode:
Voltage. . . . . 6.3 ± 10% . . . . ac or dc volts
Current. . . . . 0.6 . . . . amp
Direct Interelectrode Capacitance:
Anode to All Other Electrodes 20 . . . . $\mu\mu$f
Photocathode Spectral Response . . . . See Curve
Image Size (3 x 4 aspect ratio). . . . . 1.6" Diagonal
Focusing Method. . . . . Magnetic
Deflection Method. . . . . Magnetic
Overall Length . . . . 15-1/4" ± 1/4"
Greatest Diameter of Bulb. . . . . 3" ± 1/16"
Minimum Deflecting-Coil Inside Diameter. . . . . . . 2-1/8"
Deflecting-Coil Length . . . . 5"
Focusing-Coil Length . . . . 10"
Alignment-Coil Length. . . . . 15/16"
Photocathode Distance Inside End of Focusing Coil. . . 1/2"
Operating Position . . . . . . Any except with diheptal base up and tube axis at angle of less than 20° from the vertical
End Base . . . . Small-Shell Diheptal 14-Pin

Pin 1 - Heater
Pin 2 - Grid No.4
Pin 3 - Grid No.3
Pin 4 - Internal Connection—Do Not Use
Pin 5 - Dynode No.2
Pin 6 - Dynode No.4
Pin 7 - Anode
Pin 8 - Dynode No.5
Pin 9 - Dynode No.3
Pin 10 - Dynode No.1, Grid No.2
Pin 11 - Internal Connection—Do Not Use
Pin 12 - Grid No.1
Pin 13 - Cathode
Pin 14 - Heater

BOTTOM VIEW



Shoulder Base. . . . . Keyed Jumbo Annular 7-Pin

Pin 1 - Grid No.6
Pin 2 - Photocathode
Pin 3 - Internal Connection—Do Not Use
Pin 4 - Internal Connection—Do Not Use
Pin 5 - Grid No.5
Pin 6 - Target
Pin 7 - Internal Connection—Do Not Use

5769

RCA

5769

IMAGE ORTHICON

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

PHOTOCATHODE VOLTAGE	-550 max.	volts
PHOTOCATHODE ILLUMINATION.	50 max.	ft-c
OPERATING TEMPERATURE OF ANY PART OF BULB.	65 max.	°C
OPERATING TEMPERATURE OF BULB AT LARGE END OF TUBE (Target Section) . . .	35 min.	°C
TEMPERATURE DIFFERENCE BETWEEN TARGET SECTION AND ANY PART OF BULB HOTTER THAN TARGET SECTION.	5 max.	°C
GRID-No.6 VOLTAGE.	-550 max.	volts
TARGET VOLTAGE:		
Positive value	50 max.	volts
Negative value	50 max.	volts
GRID-No.5 VOLTAGE.	150 max.	volts
GRID-No.4 VOLTAGE.	300 max.	volts
GRID-No.3 VOLTAGE.	400 max.	volts
GRID-No.2 & DYNODE-No.1 VOLTAGE.	350 max.	volts
GRID-No.1 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.	10 max.	volts
ANODE-SUPPLY VOLTAGE⊕	1650 max.	volts
VOLTAGE PER MULTIPLIER STAGE	350 max.	volts

Typical Operation:

Photocathode Voltage (Image Focus) . . .	-300 to -500	volts
Grid-No.6 Voltage (Accelerator)— 80% of photocathode voltage.	-240 to -400	volts
Target Voltage●	0	volts
Grid-No.5 Voltage (Decelerator)●● . . .	0 to 100	volts
Grid-No.4 Voltage (Beam Focus)	160 to 240	volts
Grid-No.3 Voltage##	225 to 330	volts
Grid-No.2 & Dynode-No.1 Voltage.	300	volts
Grid-No.1 Voltage (For Picture Cutoff) .	-45 to -115	volts
Dynode-No.2 Voltage.	600	volts
Dynode-No.3 Voltage.	880	volts
Dynode-No.4 Voltage.	1160	volts
Dynode-No.5 Voltage.	1450	volts
Anode Voltage.	1500	volts
Anode Current.	50	μa
Target Temperature Range	35 to 60	°C
Highlight Illumination on Photocathode for Maximum Signal Output:		
With 2870°K Tungsten Illumination. . .	0.15	ft-c
With White Fluorescent Illumination or Daylight. .	0.07	ft-c
Ratio of Peak-to-Peak Highlight Video-Signal Cur. to RMS Noise Current (Approx.)	35	

⊕, ●, ●●, ##: See next page.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5769

IMAGE ORTHICON

Minimum Peak-to-Peak Blanking Voltage. . . .	10	volts
Field Strength at Center of Focusing Coil. .	75	gausses
Focusing-Coil Current (Approx. for coil listed below).	75	ma
Deflecting-Coil Current (Approx. for assembly listed below):		
Horizontal (Peak to Peak).	625	ma
Vertical (Peak to Peak).	290	ma
Alignment-Coil Current (Approx. for coil listed below)	0 to 30	ma

Components:

Deflecting-Coil Assembly (Includes Keyed Jumbo Annular 7-Pin Socket). . .	RCA Type No. 201D75
Focusing-Coil Assembly	RCA Type No. 202D75
Alignment-Coil Assembly.	RCA Type No. 204D75
Hor. Deflection Output Transformer . . .	RCA Type No. 204T1
Ver. Deflection Output Transformer . . .	RCA Type No. 204T2

⊕ Ratio of dynode voltages is shown under Typical Operation.

● Adjustable from -3 to +5 volts with blanking voltage off.

●● Taps at 0, 30, 60, and 90 volts are recommended. Set at voltage giving most uniform resolution and signal output over entire picture area.

Adjust to give the most uniformly shaded picture near maximum signal.

OPERATING NOTES

After the 5769 has been inserted in its sockets and the voltages applied, allow it to warm up for 1/2 to 1 hour with the camera lens iris closed. Then, proceed with normal operating adjustments.

When the equipment design or operating conditions are such that the maximum temperature rating or maximum temperature difference will be exceeded, provision should be made to direct a blast of cooling air from the diheptal-base end of the tube along the entire length of the bulb surface, i.e., through the space between the bulb surface and the surrounding deflecting coil and its extension. For this purpose, a small blower is satisfactory, but it should run at low speed to prevent vibration of the 5769 and the associated amplifier equipment. Unless vibration is prevented, distortion of the picture may occur. To keep the operating temperature of the large end of the tube from falling below 35°C, some form of controlled heating should be employed. Ordinarily, adequate heat will be supplied by the focusing coil, deflecting coils, and associated amplifier tubes so that the temperature can be controlled by the amount of cooling air directed along the bulb surface.

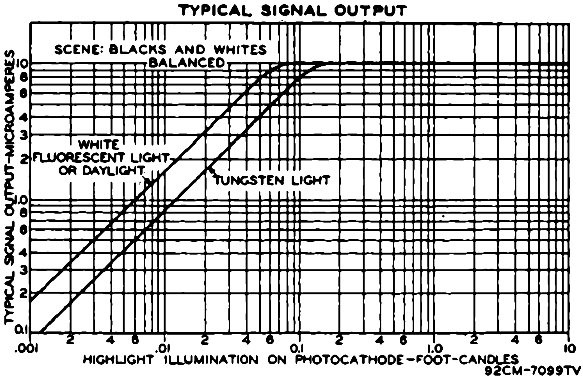
Resolution of better than 400 lines at the center of the picture can be produced by the 5769 when the highlight illumination is above the knee of the typical signal-output curve for this type. To utilize such resolution capability in the horizontal direction with the standard scanning rate of 525 lines, it is necessary to use a video amplifier having a bandwidth of at least 6.5 megacycles. The maximum resolution obtainable is limited by the mesh-screen portion of the target.

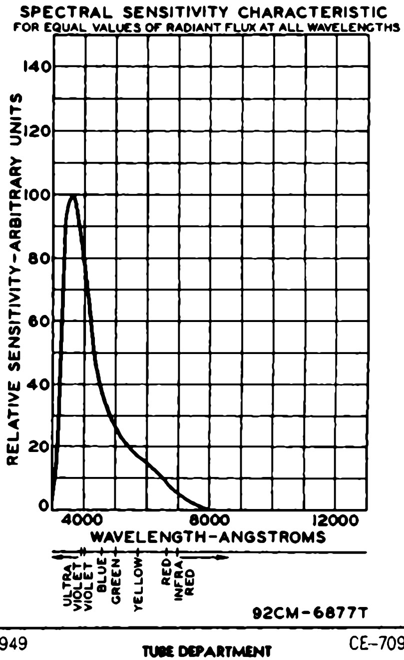
OUTLINE DIMENSIONS for the 5769 are the same as those shown for Type 5655

5769

5769

CHARACTERISTICS CURVES





5820

5820
IMAGE ORTHICON

FOR OUTDOOR AND STUDIO PICKUP

MAGNETIC FOCUS | MAGNETIC DEFLECTION

DATA

General:

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

Direct Interelectrode Capacitance (Approx.):
- Anode to all other electrodes . . . . 12 $\mu\mu$f

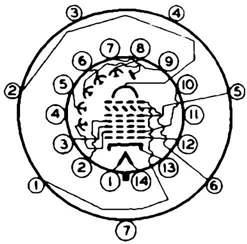
Photocathode, Semitransparent:
- Response . . . See accompanying Spectral Sensitivity curve
- Rectangular image (4 x 3 aspect ratio):
  - Useful size of . . . . 1.6" max. Diagonal
  - Orientation of . . . Proper orientation is obtained when the vertical scan is essentially parallel to the plane passing through the center of faceplate and pin No.7 of the shoulder base.

Focusing Method . . . . Magnetic
Deflection Method . . . . Magnetic
Overall Length . . . . 15-3/16" ± 1-4"
Greatest Diameter of Bulb . . . . 3" ± 1/16"
Minimum Deflecting-Coil Inside Diameter . . . . 2-3/8"
Deflecting-Coil Length . . . . 5"
Focusing-Coil Length . . . . 10"
Alignment-Coil Length . . . . 15/16"
Photocathode Distance Inside End of Focusing Coil . . . 1/2"
Operating Position: Any except with diheptal base up and tube axis at angle of less than 20° from vertical
Weight (Approx.). . . . . 1.4 lbs
End Base . . . .Small-Shell Diheptal 14-Pin (JETEC No.B14-45)

- Pin 1 - Heater
- Pin 2 - Grid No.4
- Pin 3 - Grid No.3
- Pin 4 - Internal Connection—Do Not Use
- Pin 5 - Dynode No.2
- Pin 6 - Dynode No.4
- Pin 7 - Anode
- Pin 8 - Dynode No.5
- Pin 9 - Dynode No.3
- Pin 10 - Dynode No.1, Grid No.2
- Pin 11 - Internal Connection—Do Not Use
- Pin 12 - Grid No.1
- Pin 13 - Cathode
- Pin 14 - Heater

BOTTOM VIEW

DIRECTION OF LIGHT: PERPENDICULAR TO LARGE END OF TUBE



WHITE INDEX LINE ON FACE

(Continued on next page)

← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5820

5820

IMAGE ORTHICON

Shoulder Base . . . . Keyed Jumbo Annular 7-Pin

Pin 1 - Grid No.6
Pin 2 - Photocathode
Pin 3 - Internal Connection—Do Not Use
Pin 4 - Internal Connection—Do Not Use
Pin 5 - Grid No.5
Pin 6 - Target
Pin 7 - Internal Connection—Do Not Use

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

PHOTOCATHODE:		
Voltage	-550 max.	volts
Illumination	50 max.	ft-c
OPERATING TEMPERATURE:		
→ Of any part of bulb	50 max.	°C
Of bulb at large end of tube (target section)	35 min.	°C
TEMPERATURE DIFFERENCE:		
Between target section and any part of bulb hotter than target section	5 max.	°C
GRID-No.6 VOLTAGE	-550 max.	volts
→ TARGET VOLTAGE:		
Positive value	10 max.	volts
Negative value	10 max.	volts
GRID-No.5 VOLTAGE	150 max.	volts
GRID-No.4 VOLTAGE	300 max.	volts
GRID-No.3 VOLTAGE	400 max.	volts
GRID-No.2 & DYNODE-No.1 VOLTAGE	350 max.	volts
GRID-No.1 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	10 max.	volts
→ ANODE-SUPPLY VOLTAGE*	1350 max.	volts
VOLTAGE PER MULTIPLIER STAGE	350 max.	volts

→ **Typical Operation and Characteristics:**

Photocathode Voltage (Image Focus)	-300 to -500	volts
Grid-No.6 Voltage (Accelerator)— 75% of photocathode voltage	-225 to -375	volts
Target Voltage°	0 to 3	volts
Grid-No.5 Voltage (Decelerator)	0 to 125	volts
Grid-No.4 Voltage (Beam Focus)	160 to 220	volts
Grid-No.3 Voltage#	225 to 330	volts
Grid-No.2 & Dynode-No.1 Voltage	300	volts
Grid-No.1 Voltage for Picture Cutoff	-45 to -115	volts

* Ratio of dynode voltages is shown under *Typical Operation.*
° Adjustable from -3 to +5 volts with blanking voltage off.
\# Adjust to give the most uniformly shaded picture near maximum signal.

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5820

IMAGE ORTHICON

Dynode-No.2 Voltage	600	volts
Dynode-No.3 Voltage	800	volts
Dynode-No.4 Voltage	1000	volts
Dynode-No.5 Voltage	1200	volts
Anode Voltage	1250	volts
Anode Current (DC).	30	µamp
Signal-Output Current (Peak to peak). . .	2 to 15	µamp
Target Temperature Range.	35 to 45	^{o}C
Ratio of Peak-to-Peak Highlight Video-Signal Current to RMS Noise Current (Approx.)	35	
Minimum Peak-to-Peak Blanking Voltage . .	5	volts
Field Strength at Center of Focusing Coil▲	75	gausses
Field Strength of Alignment Coil (Approx.)	0 to 3	gausses

▲ Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coil, with the indicator located outside of and at the image end of the focusing coil.

OPERATING CONSIDERATIONS

When the equipment design or operating conditions are such that the *maximum temperature rating* or *maximum temperature difference* as given under *Maximum Ratings* will be exceeded, provision should be made to direct a blast of cooling air from the diheptal-base end of the tube along the entire length of the bulb surface, i.e., through the space between the bulb surface and the surrounding deflecting-coil assembly and its extension. Any attempt to effect cooling of the tube by circulating even a large amount of air around the focusing coil will do little good, but a small amount of air directly in contact with the bulb surface will effectively drop the bulb temperature. For this purpose, a small blower is satisfactory, but it should be run at low speed to prevent vibration of the 5820 and the associated amplifier equipment. Unless vibration is prevented, distortion of the picture may occur.

To keep the operating temperature of the large end of the tube from falling below 35^{o}C, some form of controlled heating should be employed. Ordinarily, adequate heat will be supplied by the focusing coil, deflecting coils, and associated amplifier tubes so that the temperature can be controlled by the amount of cooling air directed along the bulb surface. If, in special cases, a target heater is required, it should fit between the focusing coil and the bulb near the shoulder of the tube, and be non-inductively wound.

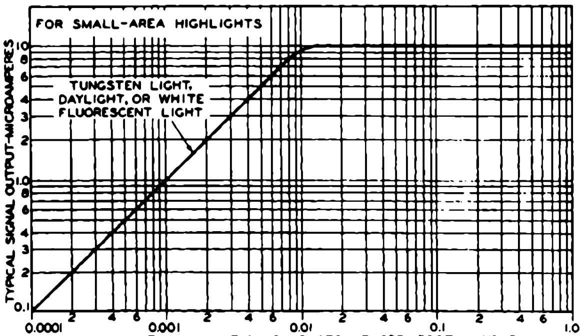
Resolution in excess of 500 lines at the center of the picture can be produced by the 5820. The Amplitude Response Characteristic shows the relative center amplitude response versus television line number for the 5820 when it is operated with the highlights at the knee of the light

5820
IMAGE ORTHICON

transfer characteristic and at one lens stop above the knee and at a temperature of 35°C. To utilize such resolution capability in the horizontal direction with the standard scanning rate of 525 lines, it is necessary to use a video amplifier having a bandwidth of at least 6 megacycles. The maximum resolution obtainable is limited by the mesh-screen portion of the target.

For very high illumination or for individual tubes with exceptionally high photocathode sensitivity, it may not be possible to stop the lens down far enough to reduce the highlight illumination on the photocathode to a value near the knee of the transfer characteristic. When such a condition is encountered, the use of a Wratten neutral filter selected to give the required reduction in illumination is recommended. Ordinarily, two filters--one having 10% transmission and the other 20%--will give sufficient choice.

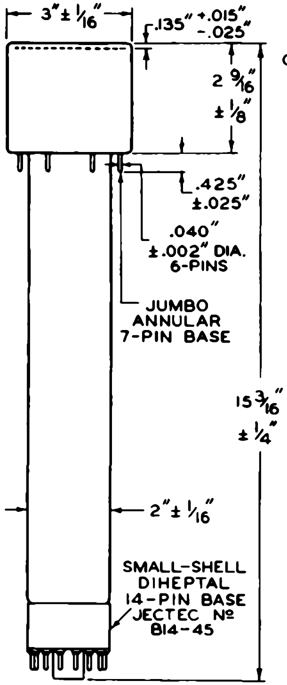
LIGHT TRANSFER CHARACTERISTIC



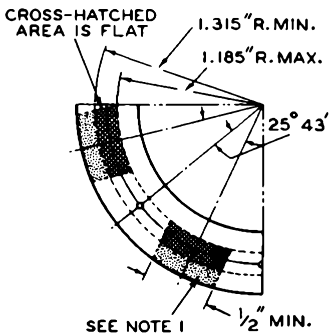
5820

5820

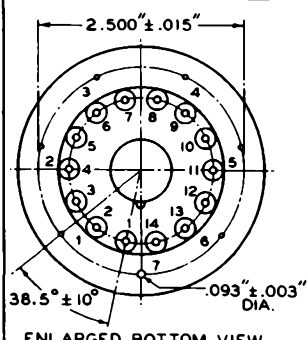
IMAGE ORTHICON



DETAIL OF BOTTOM VIEW OF JUMBO ANNULAR BASE



NOTE 1: DOTTED AREA IS FLAT OR EXTENDS TOWARD DIHEPTAL-BASE END OF TUBE BY 0.060" MAX.



ENLARGED BOTTOM VIEW

ANNULAR BASE GAUGE

ANGULAR VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF NECK CYLINDER WITH RESPECT TO PHOTOCATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND NECK CYLINDER WILL FIT FLAT-PLATE GAUGE WITH:

a. SIX HOLES HAVING DIAMETER OF 0.065" ± 0.001" AND ONE HOLE HAVING DIAMETER OF 0.150" ± 0.001". ALL HOLES HAVE DEPTH OF 0.265" ± 0.001". THE SIX 0.065" HOLES ARE ENLARGED BY 45° TAPER TO DEPTH OF 0.047". ALL HOLES ARE SPACED AT ANGLES OF 51°26' ±5' ON CIRCLE DIAMETER OF 2.500" ± 0.015".

b. SIX STOPS HAVING HEIGHT OF 0.187" ± 0.001", CENTERED BETWEEN PIN HOLES, TO BEAR AGAINST FLAT AREAS OF BASE.

c. RIM EXTENDING OUT A MINIMUM OF 1/8" FROM 2-13/16" DIAMETER AND HAVING HEIGHT OF 0.126" ± 0.001".

d. NECK-CYLINDER CLEARANCE HOLE HAVING DIAMETER OF 2.200" ± 0.001".

92CM-8293R1

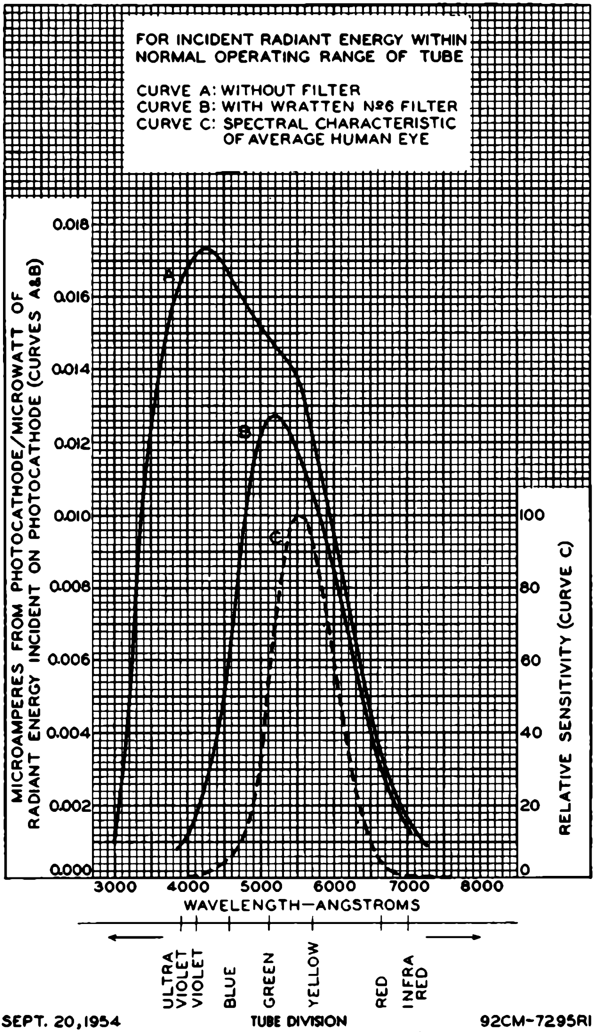
JAN. 3, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-8293R1

5820

SPECTRAL SENSITIVITY CHARACTERISTIC WITH AND WITHOUT FILTER



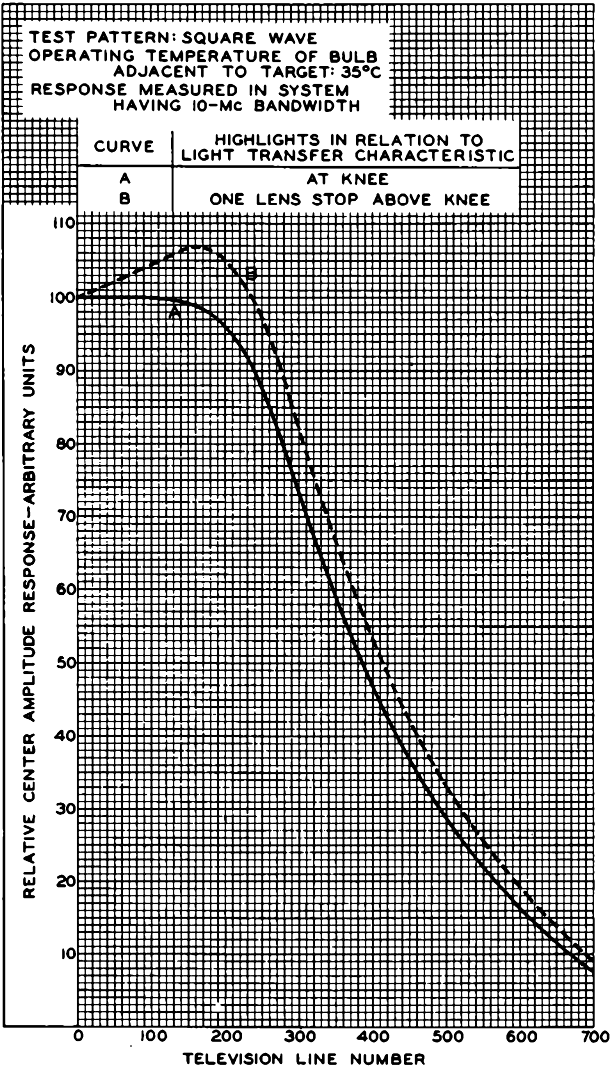
SEPT. 20, 1954 | TUBE DIVISION | 92CM-7295R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5820

5820

AMPLITUDE RESPONSE CHARACTERISTICS



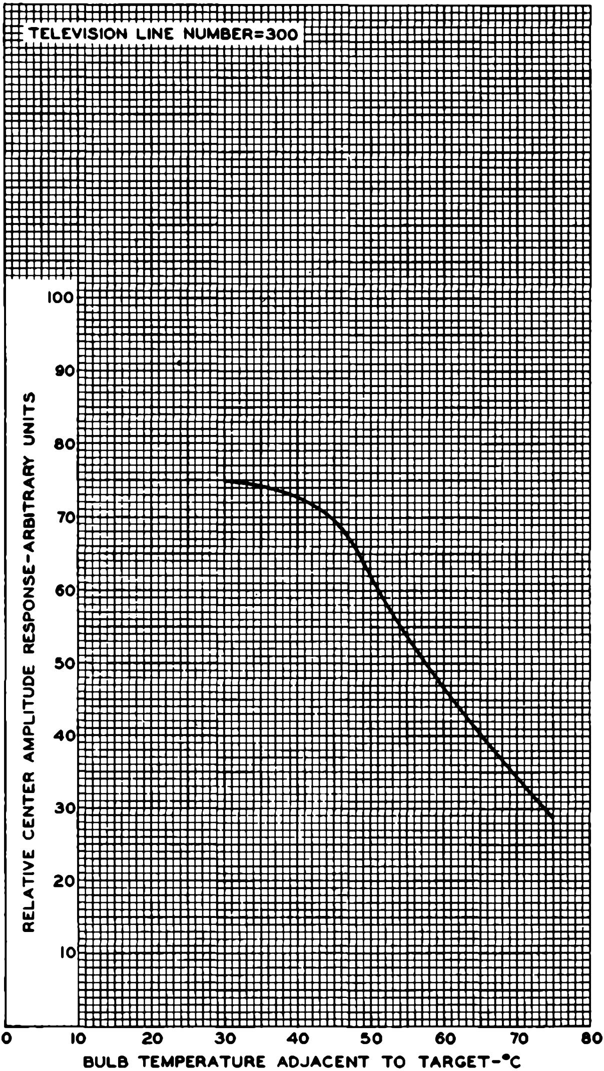
SEPT. 23, 1954 | TUBE DIVISION | 92CM-8439

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5820

5820

TEMPERATURE EFFECT ON AMPLITUDE RESPONSE



6198

6198

VIDICON

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

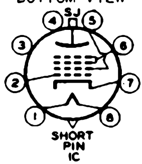
Heater, for Unipotential Cathode:		
Voltage	6.3 ± 10%	ac or dc volts
Current	0.6	amp
Direct Interelectrode Capacitance:		
Signal Electrode to All Other Electrodes	4.5	μμf
Spectral Response		See Curve
Photoconductive Layer:		
Maximum Useful Diagonal of Rectangular Image (4 x 3 Aspect Ratio)	0.62	inch

Orientation of Quality Rectangle--Proper orientation is obtained when the horizontal scan is essentially parallel to the plane passing through the tube axis and short index pin.

Focusing Method	Magnetic
Deflection Method	Magnetic
Overall Length	6-1/4" ± 1/4"
Greatest Diameter (Excluding Side Tip)	1.125" ± 0.010"
Maximum Radius (Including Side Tip)	0.805"
Bulb	T-8
Operating Position	Any
Base	Small-Button Ditetrar 8-Pin (JETEC No.E8-11)

BOTTOM VIEW

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Int. Conn.-- Do Not Use
Pin 4 - Int. Conn.-- Do Not Use
Pin 5 - Grid No.2
Pin 6 - Grid No.3, Grid No.4



DIRECTION OF LIGHT: INTO FACE END OF TUBE

Pin 7 - Cathode
Pin 8 - Heater
Flange (SJ) - Signal Electrode
Short Index Pin - Int. Conn.-- Make No Conn.

Maximum Ratings, *Absolute Values:*

SIGNAL-ELECTRODE VOLTAGE	125 max.	volts
GRID-No.4 & GRID-No.3 VOLTAGE	350 max.	volts
GRID-No.2 VOLTAGE	350 max.	volts
GRID-No.1 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	10 max.	volts
FACEPLATE TEMPERATURE	60 max.	°C

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6198

6198

VIDICON

Typical Operation and Characteristics:

For scanned area of 1/2" x 3/8"

Signal-Electrode Voltage for Dark Current of 0.02 μamp	10 to 125	volts
Grid-No.4 (Decelerator) & Grid-No.3 (Beam Focus) Voltage	200 to 300	volts
Grid-No.2 (Accelerator) Voltage . . .	300	volts
Grid-No.1 Voltage (For picture cutoff) . . .	-45 to -100	volts
Signal-Output Current:*		
Normal Operating Range.	0.1 to 0.2	μamp
Minimum, with 0.6 foot-candle of uniform 2870°K tungsten illumination on tube face	0.02	μamp
Uniform 2870°K Tungsten Illumination on Tube Face to Produce Signal-Output Current of 0.1 to 0.2 μamp	3 to 10	ft-c
Ratio (Approx.) of Tube-Face Illumination Required to Produce Signal-Output Current of 0.2 μamp to That Required to Produce 0.02 μamp . . .	30	
Minimum Peak-to Peak Blanking Voltage:		
When applied to grid No.1	30	volts
When applied to cathode	10	volts
Field Strength at Center of Focusing Device	40	gausses
Field Strength of Adjustable Alignment Coil.	0 to 4	gausses

* Defined as the component of the signal-electrode current after the dark-current component has been subtracted.

OPERATING CONSIDERATIONS

The *base pins* of the 6198 fit the ditetrar 8-pin connector such as Cinch No.54A18088, or equivalent.

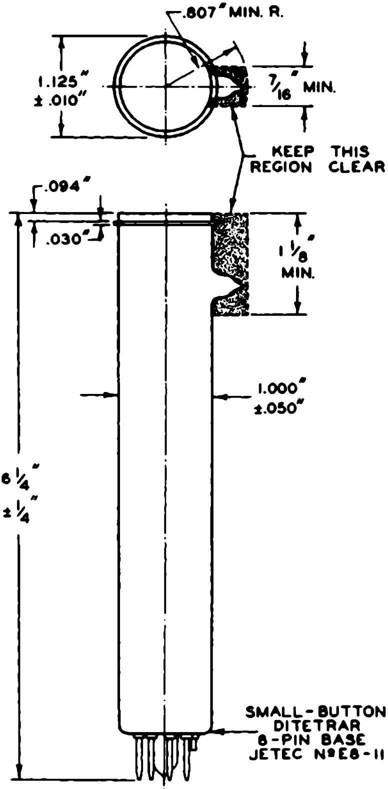
Resolution of better than 350 lines at the center of the picture can be produced by the 6198. To utilize the resolution capability of the 6198 in the horizontal direction with the standard scanning rate of 525 lines, it is necessary to use a video amplifier having a bandwidth of at least 6 megacycles per second. The maximum resolution obtainable is limited by the size of the scanning-beam spot.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6198

6198

VIDICON



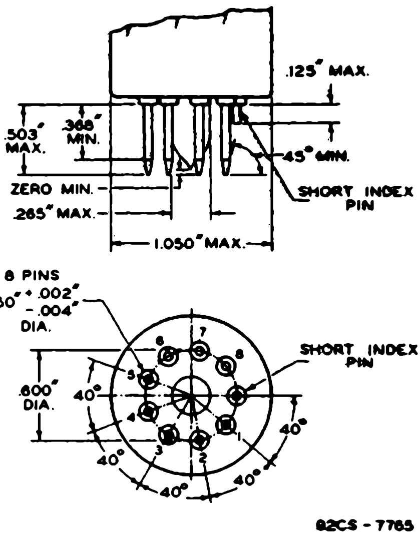
92CS-7772

6198

6198

VIDICON

SMALL - BUTTON DITETRAR 8 - PIN BASE JETEC Nº E8 - 11

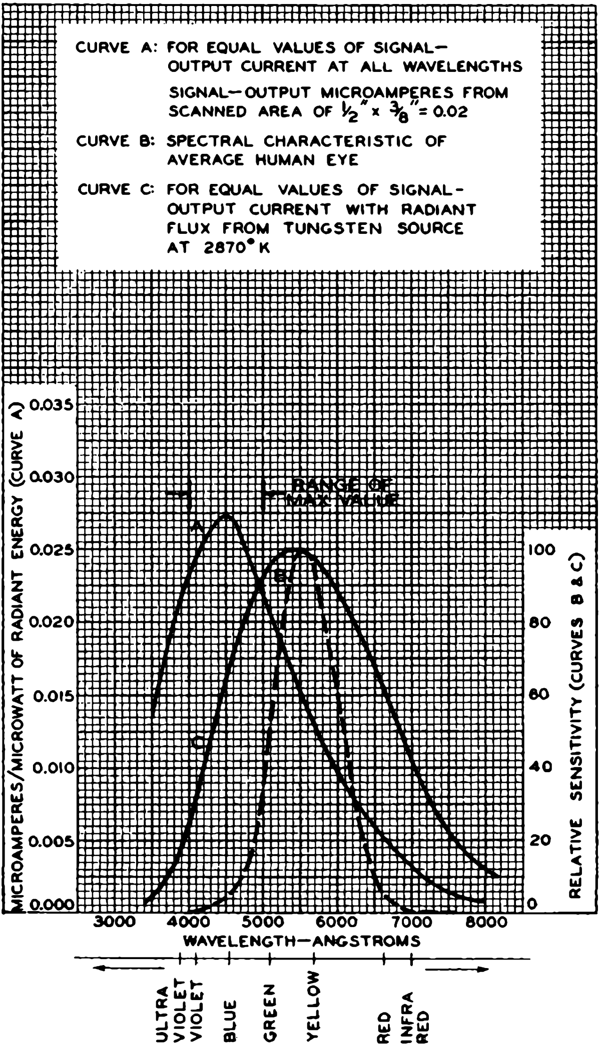


Base-pin positions are held to tolerances such that pins will fit a flat-plate gauge having thickness of 1/4" and 9 holes 0.0700" ± 0.0005" so located on a 0.6000" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.2052" ± 0.0005". Gauge is provided with center hole having diameter of 0.300" ± 0.001" and same center as the pin circle.

SEPT. 1, 1952 CE-7765

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

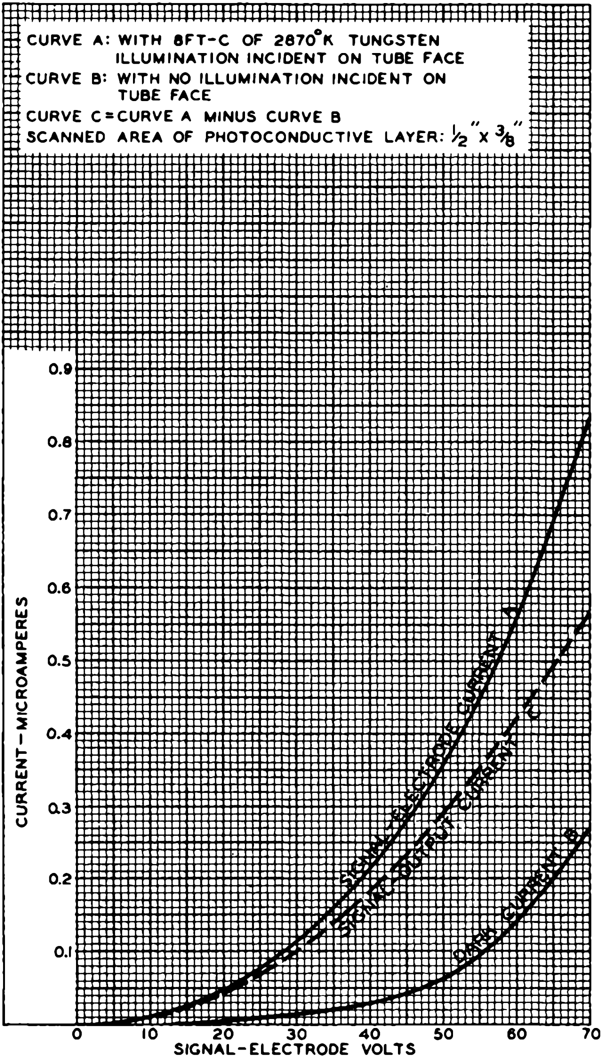
SPECTRAL SENSITIVITY CHARACTERISTIC



6198

6198

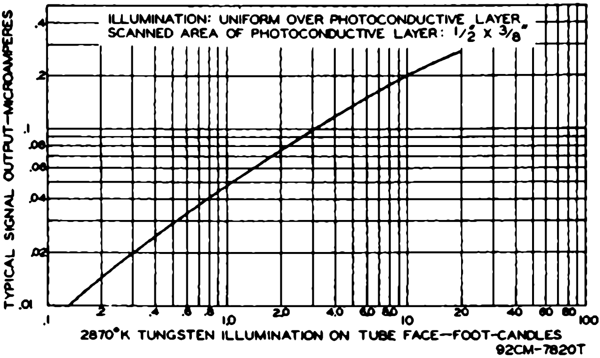
TYPICAL CHARACTERISTICS

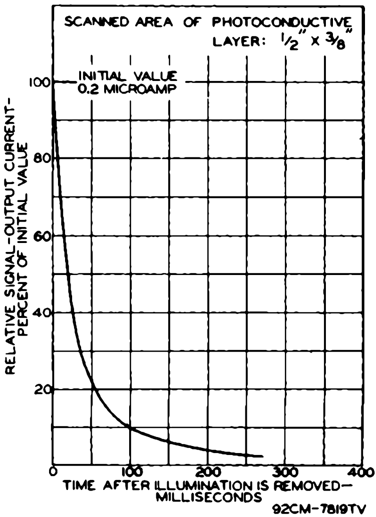


RCA

6198

VIDICON





TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6326

6326

VIDICON

FOR PICKUP FROM MOTION-PICTURE FILM

600-LINE RESOLUTION

DATA

General:

Heater, for Unipotential Cathode:

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

Direct Interelectrode Capacitance:♠

Signal Electrode to All Other Electrodes	4.5	$\mu\mu f$

Spectral Response . . . . . See Curves

Photoconductive Layer:

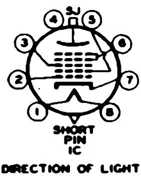
Maximum Useful Diagonal of Rectangular Image (4 x 3 Aspect Ratio)	0.62	inch

Orientation of Quality Rectangle—Proper orientation is obtained when the horizontal scan is essentially parallel to the plane passing through the tube axis and short index pin.

Focusing Method	Magnetic
Deflection Method	Magnetic
Overall Length	6-1/4" ± 1/4"
Greatest Diameter (Excluding side tip)	1.125" ± 0.010"
Maximum Radius (Including side tip)	0.805"
Bulb	T-8
Operating Position	Approx. horizontal, or faceplate up
Weight (Approx.)	2 oz
Base	Small-Button Ditetrar 8-Pin (JETEC No.E8-11)

BOTTOM VIEW

Pin 1: Heater
Pin 2: Grid No.1
Pin 3: Grid No.3
Pin 4: Int. Conn.—Do Not Use
Pin 5: Grid No.2
Pin 6: Grid No.4, Grid No.5



DIRECTION OF LIGHT: INTO FACE END OF TUBE

Pin 7: Cathode
Pin 8: Heater
Flange (SJ): Signal Electrode
Short Index Pin: Int. Conn.—Make No Connection

Maximum Ratings, *Absolute Values:*

SIGNAL-ELECTRODE VOLTAGE	125 max.	volts
GRID-No.5 & GRID-No.4 VOLTAGE	350 max.	volts
GRID-No.3 VOLTAGE	350 max.	volts
GRID-No.2 VOLTAGE	350 max.	volts
GRID-No.1 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	10 max.	volts

♠ This capacitance, which effectively is the output impedance of the 6326, is increased by about 3 $\mu\mu f$ when the tube is mounted in the RCA deflecting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 megohms.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6326
VIDICON

FACEPLATE:

Illumination	1000 max.	ft-c
Temperature	60 max.	°C

Typical Operation with Static Focusing:

Grid No.3 connected to grids No.4 and No.5; scanned area of 1/2" x 3/8"

Faceplate Illumination:		
Average Highlight♠, for pickup from film	100 to 300	ft-c
Constant, for pickup from transparencies or opaques	10	ft-c
Signal-Electrode Voltage:		
For pickup from film	10 to 30	volts
For pickup from transparencies or opaques	30 to 60	volts
Grid-No.5 (Decelerator) and Grids-No.4 & No.3 (Beam-Focus Electrodes*) Voltage	200 to 300	volts
Grid-No.2 (Accelerator) Voltage	300	volts
Grid-No.1 Voltage for Picture Cutoff	-45 to -100	volts
Highlight Signal-Electrode Current	0.3 to 0.4	μamp
Average Signal-Output Current#	0.1 to 0.2	μamp
Maximum Dark Current:		
For pickup from film	0.004	μamp
For pickup from transparencies or opaques	0.02	μamp
Average "Gamma" of Transfer Characteristic for signal-output current between 0.02 μamp and 0.2 μamp	0.65	
Visual Equivalent Signal-to-Noise Ratio (Approx.)○	300:1	
Minimum Peak-to-Peak Blanking Voltage:		
When applied to grid No.1	40	volts
When applied to cathode	10	volts
Field Strength of Adjustable Alignment Coil	0 to 4	gausses

♠ Averaged over the time of one TV frame.

* Beam focus is obtained by combined effect of grids-No.4 & No.3 voltage which should be adjustable over indicated range, and RCA-217D1 Focusing Coil with 40 milliamperes passing through it.

\# Defined as the component of the signal-electrode current after the dark-current component has been subtracted.

○ For amplifier system of the low-noise cascode type having 8-Mc bandwidth. Because the noise in such a system is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of highlight video-signal current to rms noise current, multiplied by a factor of 3.

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6326
VIDICON

Typical Operation with Dynamic Focusing:

Grid No.3 used separately as Dynamic Focusing Electrode; scanned area of 1/2" x 3/8"

Values are the same as shown above for *Typical Operation with Static Focusing* except as follows:

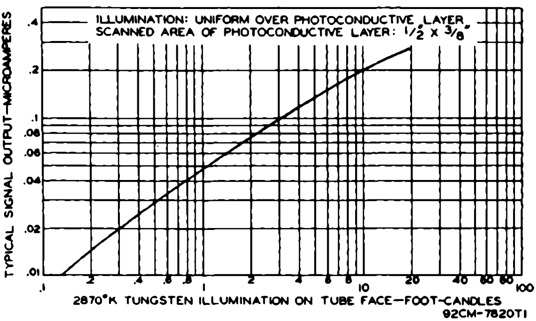
Grid-No.5 (Decelerator) and Grid-No.4 (Beam-Focus Electrode**) Voltage	200 to 300	volts
Grid-No.3 (Dynamic-Focus Electrode**) Voltage:		
DC value	200 to 300	volts
Peak-to-peak value (Approx.).	60	volts

** Static beam focus is obtained by combined effect of grid-No.4 voltage which should be adjustable over indicated range, and RCA-217D1 Focusing Coil with 40 milliamperes passing through it. Dynamic beam focus to give improved edge focus is supplementary to static beam focus and is accomplished by adjusting the dc grid-No.3 voltage to the same value as that of grid No.4 and by applying to grid No.3 an ac voltage having parabolic waveform.

BASE CONNECTOR

The *base pins* of the 6326 fit the ditetrar 8-contact connector, such as Cinch No.54A18088, or equivalent.

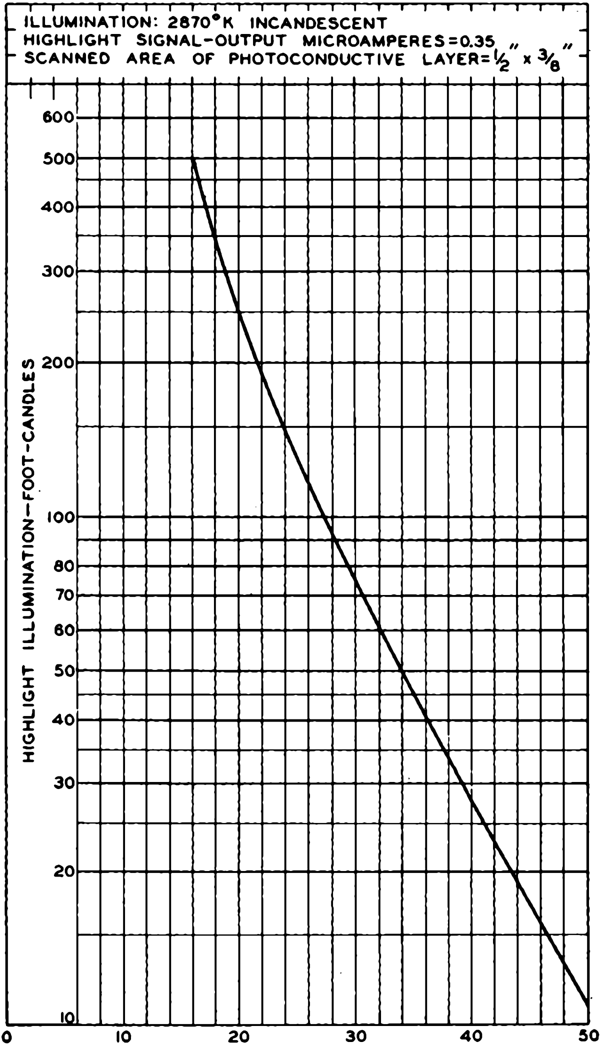
SPECTRAL SENSITIVITY CHARACTERISTIC,
DIMENSIONAL OUTLINE,
and
BASE DIMENSIONS
are the same as shown for Type 6198



6326

6326

TYPICAL CHARACTERISTIC



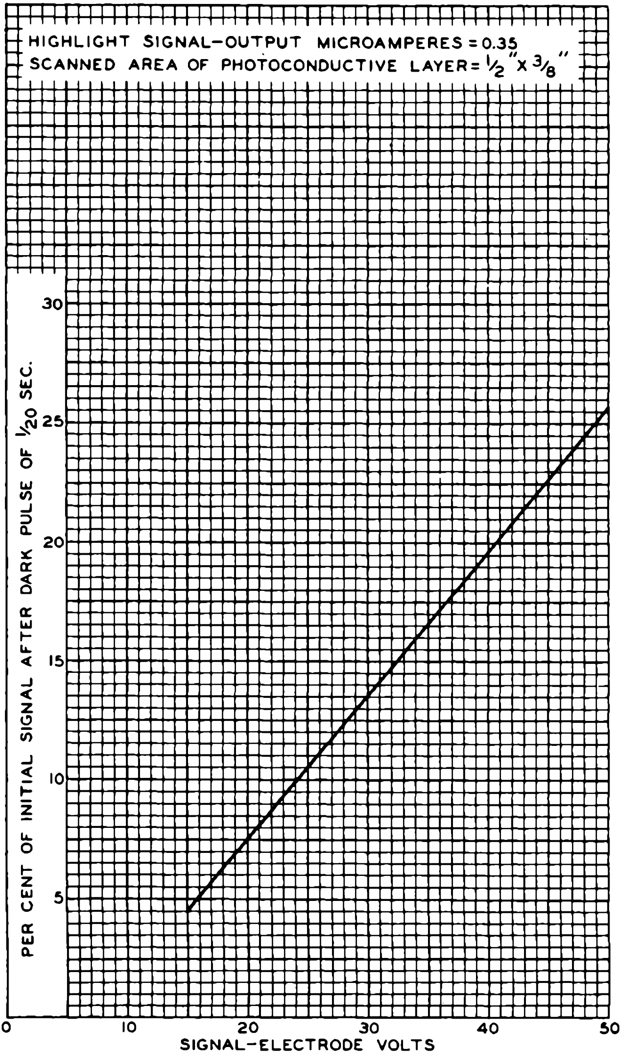
OCT. 12, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8118

6326

PERSISTENCE CHARACTERISTIC



OCT. 12, 1953

6326-A

6326-A
VIDICON

600-LINE RESOLUTION

For film and live pickup
with color or black-and-white TV cameras

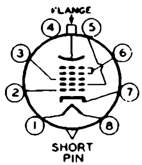
The 6326-A is an improved version of the 6326 and is unilaterally interchangeable with it.

DATA

General:

Heater, for Unipotential Cathode:
  Voltage . . . . 6.3 ± 10% . . . . ac or dc volts
  Current . . . . 0.6 . . . . amp
Direct Interelectrode Capacitance:♣
  Signal electrode to
    all other electrodes. . . . . 4.5 μμf
Spectral Response . . . . *See Curves*
Photoconductive Layer:
  Maximum useful diagonal of rectangular
    image (4 x 3 aspect ratio). . . . . 0.62"
  Orientation of quality rectangle—Proper orientation is obtained when the horizontal scan is essentially parallel to the straight sides of the masked portions of the faceplate. The straight sides are parallel to the plane passing through the tube axis and short index pin. The masking is for orientation only and does not define the proper scanned area of the photoconductive layer.
Focusing Method . . . . Magnetic
Deflection Method . . . . Magnetic
Overall Length. . . . . 6-1/4" ± 1/4"
Greatest Diameter . . . . 1.125" ± 0.010"
Weight (Approx.). . . . . 2 oz
Operating Position. . . . Approx. horizontal, or faceplate up
Bulb. T-8
Base Connector. . . . . Cinch No.54A18088, or equivalent
Base. . . . . . . Small-Button Ditetrar 8-Pin (JETEC No.E8-11)
  Basing Designation for BOTTOM VIEW. 8HL

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No.3
Pin 4 - Internal Connection—Do Not Use
Pin 5 - Grid No.2
Pin 6 - Grid No.4, Grid No.5



DIRECTION OF LIGHT: INTO FACE END OF TUBE

Pin 7 - Cathode
Pin 8 - Heater
Flange - Signal Electrode
Short Index Pin—Internal Connection—Make No Connection

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

SIGNAL-ELECTRODE VOLTAGE. . . . . 100 max. volts
GRID-No.5 & GRID-No.4 VOLTAGE . . . . 350 max. volts

♣ This capacitance, which effectively is the output impedance of the 6326-A, is increased by about 3 μμf when the tube is mounted in the deflecting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 megohms.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6326-A

VIDICON

GRID-No.3 VOLTAGE	350 max.	volts
GRID-No.2 VOLTAGE	350 max.	volts
GRID-No.1 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.	10 max.	volts
FACEPLATE:		
Illumination.	1000 max.	ft-c
Temperature	60 max.	°C

Typical Operation with Static Focusing:

Grid No.3 connected to grids No.4 and No.5; scanned area of 1/2" x 3/8"

Faceplate Illumination:		
Average highlight▲, for pickup from film.	50 to 300	ft-c
Constant highlight, for pickup from limited-motion live scenes.	20	ft-c
Signal-Electrode Voltage:		
For pickup from film.	20 to 40	volts
For pickup from limited-motion live scenes	40 to 70	volts
Grid-No.5 (Decelerator) and Grids-No.4 & No.3 (Beam-Focus Electrodes•) Voltage.	200 to 300	volts
Grid-No.2 (Accelerator) Voltage	300	volts
Grid-No.1 Voltage for Picture Cutoff●	-45 to -100	volts
Highlight Signal-Electrode Current. . . .	0.3 to 0.4	μamp
Average Signal-Output Current#.	0.1 to 0.2	μamp
Peak Signal-Output Current.	0.3 to 0.4	μamp
Maximum Dark Current:		
For pickup from film.	0.004	μamp
For pickup from limited-motion live scenes	0.02	μamp
Average "Gamma" of Transfer Characteristic for signal-output current between 0.02 μamp and 0.2 μamp.	0.65	
Visual Equivalent Signal-to-Noise Ratio (Approx.)○.	300:1	
Minimum Peak-to-Peak Blanking Voltage:		
When applied to grid No.1	40	volts
When applied to cathode	10	volts
Field Strength of Adjustable Alignment Coil.	0 to 4	gausses

▲,•,●,#,○: See next page.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6326-A
VIDICON

Typical Operation with Dynamic Focusing:

Grid No. 3 used separately as Dynamic Focusing Electrode; scanned area of 1/2" x 3/8"

Values are the same as those shown for *Typical Operation with Static Focusing* except as follows:

Grid-No.5 (Decelerator) and Grid-No.4 (Beam-Focus Electrode**) Voltage	200 to 300	volts
Grid-No.3 (Dynamic-Focus Electrode**) Voltage:		
DC value	140 to 240	volts
Peak-to-peak value (Approx.)	60	volts

▲ Averaged over the time of one TV frame.

* Beam focus is obtained by combined effect of grids-No.4 & No.3 voltage which should be adjustable over indicated range, and a focusing coil having an average field strength of 40 gausses.

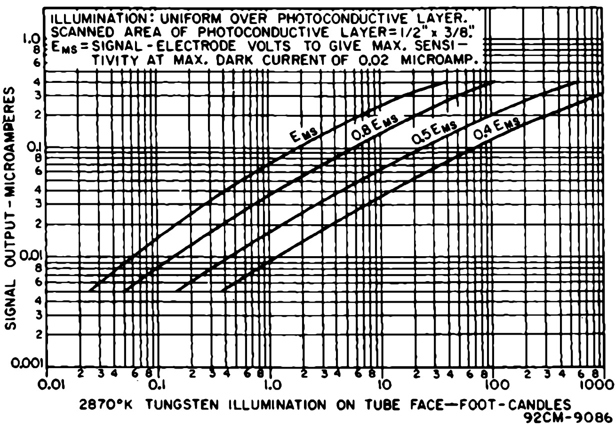
● With no blanking voltage on grid No.1.

\# Defined as the component of the signal-electrode current after the dark-current component has been subtracted.

o For amplifier system of the low-noise cascode type having 8-Mc bandwidth. Because the noise in such a system is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of highlight video-signal current to rms noise current, multiplied by a factor of 3.

** Static beam focus is obtained by combined effect of grid-No.4 voltage which should be adjustable over indicated range, and a focusing coil having an average field strength of 40 gausses. Dynamic beam focus to give improved edge focus is supplementary to static beam focus and is accomplished by adjusting the dc grid-No.3 voltage to a value about 60 volts lower than that of grid No.4 and by applying to grid No.3 an ac voltage having parabolic waveform.

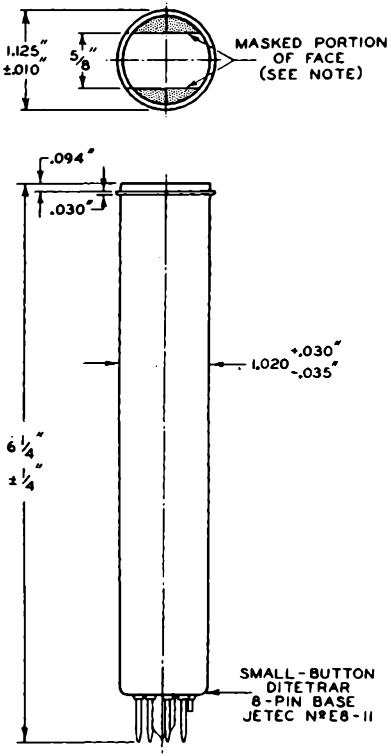
TYPICAL LIGHT TRANSFER CHARACTERISTICS



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6326-A
VIDICON



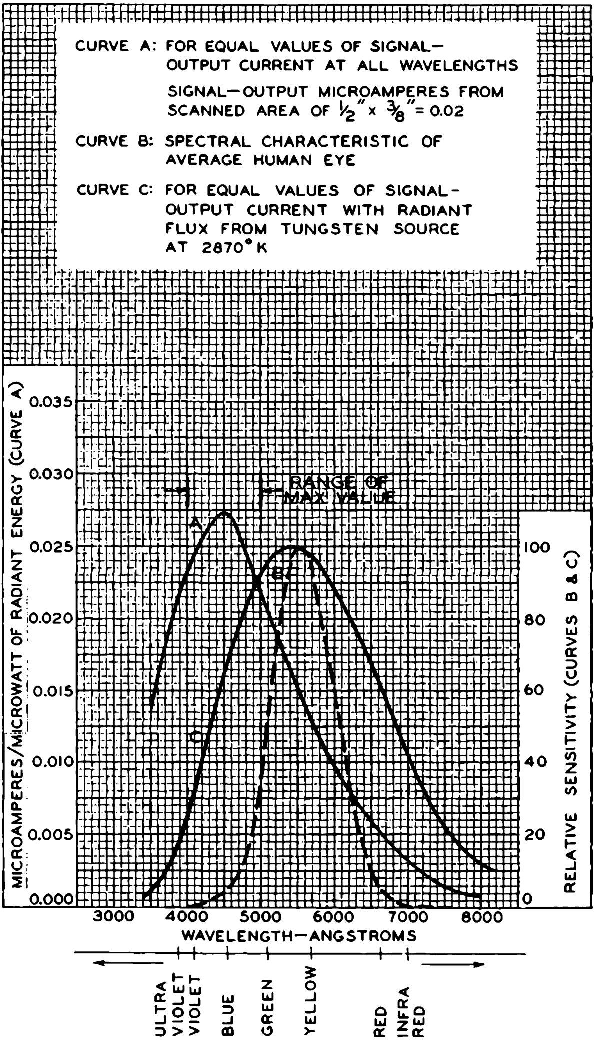
92CS-9081

NOTE: STRAIGHT SIDES OF MASKED PORTIONS ARE PARALLEL TO THE PLANE PASSING THROUGH TUBE AXIS AND SHORT INDEX PIN.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6326-A

SPECTRAL SENSITIVITY CHARACTERISTICS



TUBE DIVISION

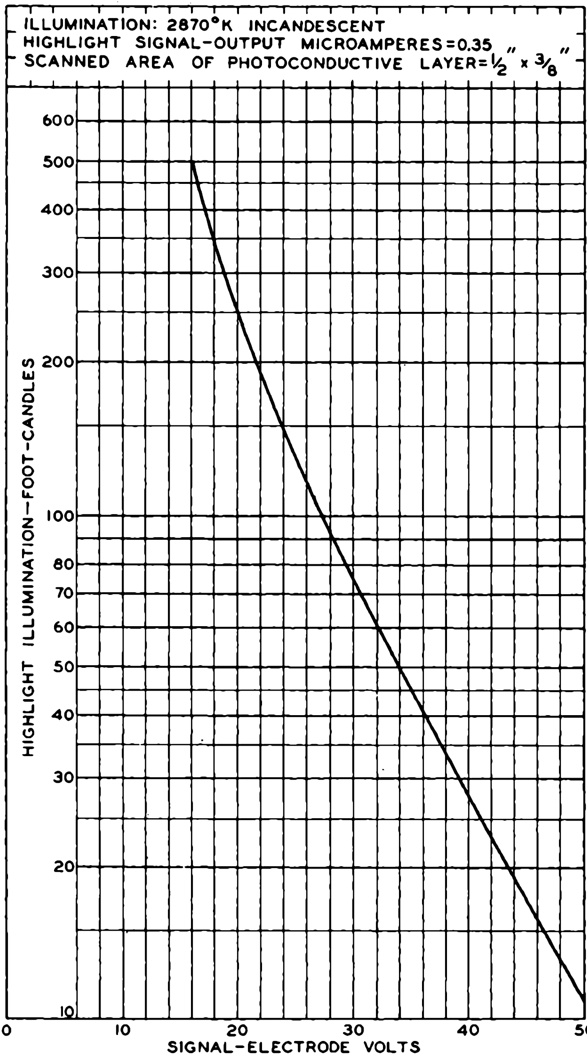
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7783R1

RCA

6326-A

TYPICAL CHARACTERISTIC



TUBE DIVISION

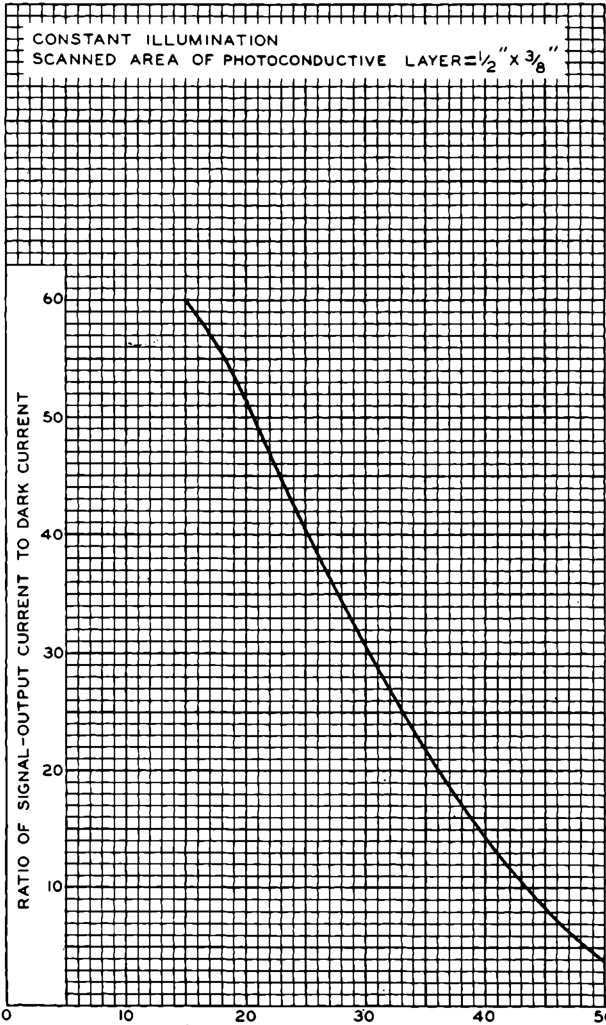
92CM-8118

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6326-A

6326-A

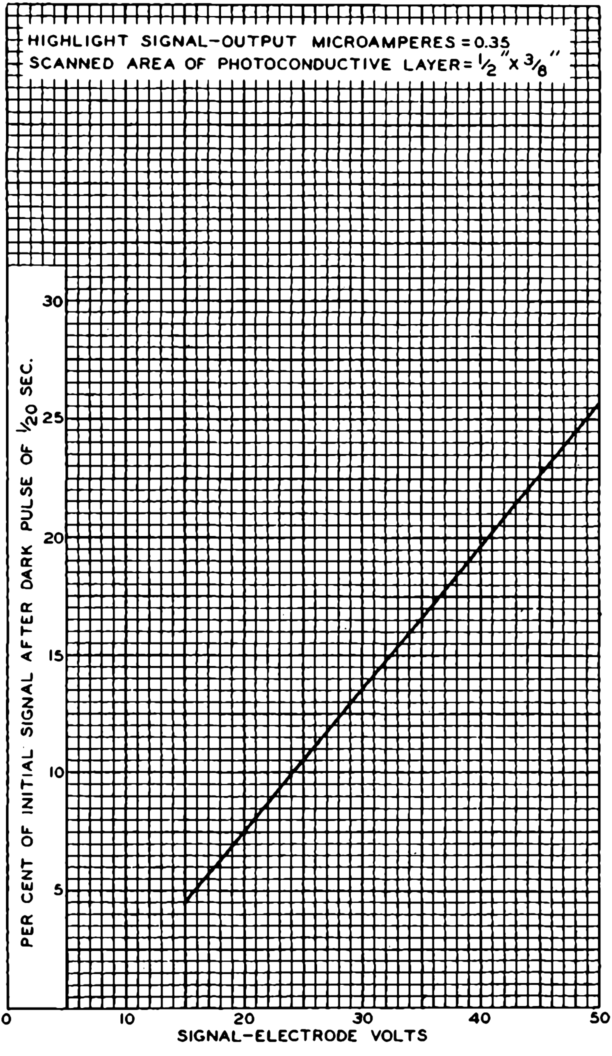
TYPICAL CHARACTERISTIC



6326-A

6326-A

PERSISTENCE CHARACTERISTIC



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8119

6474/1854

IMAGE ORTHICON

FOR SIMULTANEOUS COLOR PICKUP

MAGNETIC FOCUS — MAGNETIC DEFLECTION

DATA

General:

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

Direct Interelectrode Capacitance:
- Anode to all other electrodes . . . . 20 $\mu\mu$f

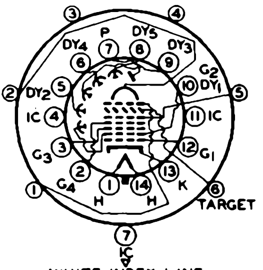
Photocathode, Semitransparent:
- Response . . . See accompanying Spectral Sensitivity curve
- Rectangular image (4 x 3 aspect ratio):
  - Useful size of . . . . 1.6" max. Diagonal
  - Orientation of . . . Proper orientation is obtained when the vertical scan is essentially parallel to the plane passing through center of faceplate and pin No.7 of the shoulder base.

Focusing Method . . . . Magnetic
Deflection Method . . . . Magnetic
Overall Length . . . . 15-3/16" ± 1/4"
Greatest Diameter of Bulb . . . . 3" ± 1/16"
Minimum Deflecting-Coil Inside Diameter . . . . 2-3/8"
Deflecting-Coil Length . . . . 5"
Focusing-Coil Length . . . . 10"
Alignment-Coil Length . . . . 15/16"
Photocathode Distance Inside End of Focusing Coil . . . 1/2"
Operating Position: Any except with diheptal base up and tube axis at angle of less than 20° from vertical
Weight (Approx.) . . . . 1 lb 6 oz
End Base . . . . Small-Shell Diheptal 14-Pin Base (JETEC No.B14-45)

- Pin 1 - Heater
- Pin 2 - Grid No.4
- Pin 3 - Grid No.3
- Pin 4 - Internal Connection—Do Not Use
- Pin 5 - Dynode No.2
- Pin 6 - Dynode No.4
- Pin 7 - Anode
- Pin 8 - Dynode No.5
- Pin 9 - Dynode No.3
- Pin 10 - Dynode No.1, Grid No.2
- Pin 11 - Internal Connection—Do Not Use
- Pin 12 - Grid No.1
- Pin 13 - Cathode
- Pin 14 - Heater

BOTTOM VIEW

DIRECTION OF LIGHT: PERPENDICULAR TO LARGE END OF TUBE



WHITE INDEX LINE ON FACE

(Continued on next page)

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6474

RCA

6474

IMAGE ORTHICON

Shoulder Base . . . . Keyed Jumbo Annular 7-Pin

Pin 1 - Grid No.6
Pin 2 - Photocathode
Pin 3 - Internal Connection—Do Not Use
Pin 4 - Internal Connection—Do Not Use
Pin 5 - Grid No.5
Pin 6 - Target
Pin 7 - Internal Connection—Do Not Use

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

PHOTOCATHODE:		
Voltage	-550 max.	volts
Illumination	50 max.	ft-c
OPERATING TEMPERATURE:		
Of any part of bulb	50 max.	°C
Of bulb at large end of tube (target section)	35 min.	°C
TEMPERATURE DIFFERENCE:		
Between target section and any part of bulb hotter than target section . .	5 max.	°C
GRID-No.6 VOLTAGE	-550 max.	volts
TARGET VOLTAGE:		
Positive value	10 max.	volts
Negative value	10 max.	volts
GRID-No.5 VOLTAGE	150 max.	volts
GRID-No.4 VOLTAGE	300 max.	volts
GRID-No.3 VOLTAGE	400 max.	volts
GRID-No.2 & DYNODE-No.1 VOLTAGE	350 max.	volts
GRID-No.1 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 .	10 max.	volts
ANODE-SUPPLY VOLTAGE*	1350 max.	volts
VOLTAGE PER MULTIPLIER STAGE	350 max.	volts

Typical Operation and Characteristics:

Photocathode Voltage (Image Focus) . .	-300 to -500	volts
Grid-No.6 Voltage (Accelerator)— 75% of photocathode voltage	-225 to -375	volts
Target Voltage°	0 to 3	volts
Grid-No.5 Voltage (Decelerator)	0 to 125	volts
Grid-No.4 Voltage (Beam Focus)	160 to 220	volts
Grid-No.3 Voltage#	225 to 330	volts
Grid-No.2 & Dynode-No.1 Voltage	300	volts
Grid-No.1 Voltage for Picture Cutoff .	-45 to -115	volts

* Ratio of dynode voltages is shown under *Typical Operation.*

° Adjustable from -3 to +5 volts with blanking voltage off.

\# Adjust to give the most uniformly shaded picture near maximum signal.

6474

IMAGE ORTHICON

Dynode-No.2 Voltage	600	volts
Dynode-No.3 Voltage	800	volts
Dynode-No.4 Voltage	1000	volts
Dynode-No.5 Voltage	1200	volts
Anode Voltage	1250	volts
Anode Current (DC)	30	μamp
Signal-Output Current (Peak to peak) . .	3 to 20	μamp
Target Temperature Range	35 to 45	°C
Ratio of Peak-to-Peak Highlight Video-Signal Current to RMS Noise Current (Approx.)	60	
Minimum Peak-to-Peak Blanking Voltage . .	5	volts
Field Strength at Center of Focusing Coil▲	75	gausses
Field Strength of Alignment Coil (Approx.)	0 to 3	gausses

▲ Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coil, with the indicator located outside of and at the image end of the focusing coil.

OPERATING CONSIDERATIONS

When the equipment design or operating conditions are such that the *maximum temperature rating* or *maximum temperature difference* as given under *Maximum Ratings* will be exceeded, provision should be made to direct a blast of cooling air from the diheptal-base end of the tube along the entire length of the bulb surface, i.e., through the space between the bulb surface and the surrounding deflecting-coil assembly and its extension. Any attempt to effect cooling of the tube by circulating even a large amount of air around the focusing coil will do little good, but a small amount of air directly in contact with the bulb surface will effectively drop the bulb temperature. For this purpose, a small blower is satisfactory, but it should be run at low speed to prevent vibration of the 6474 and the associated amplifier equipment. Unless vibration is prevented, distortion of the picture may occur.

To keep the operating temperature of the large end of the tube from falling below 35°C, some form of controlled heating should be employed. Ordinarily, adequate heat will be supplied by the focusing coil, deflecting coils, and associated amplifier tubes so that the temperature can be controlled by the amount of cooling air directed along the bulb surface. If, in special cases, a target heater is required, it should fit between the focusing coil and the bulb near the shoulder of the tube, and be non-inductively wound.

RCA

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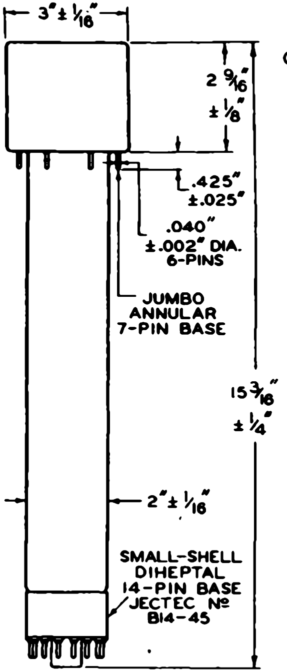
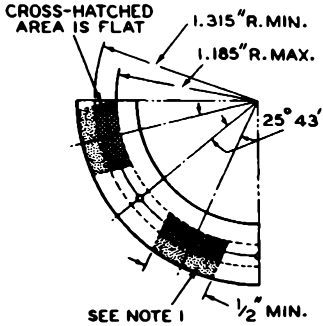
IMAGE ORTHICON



DETAIL OF BOTTOM VIEW OF JUMBO ANNULAR BASE



NOTE 1: DOTTED AREA IS FLAT OR EXTENDS TOWARD DIHEPTAL-BASE END OF TUBE BY 0.060" MAX.

ANNULAR BASE GAUGE

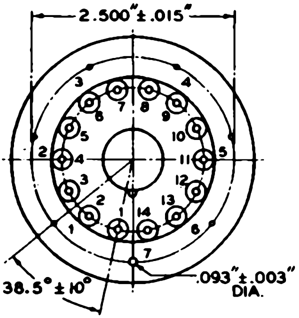
ANGULAR VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF NECK CYLINDER WITH RESPECT TO PHOTOCATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND NECK CYLINDER WILL FIT FLAT-PLATE GAUGE WITH:

a. SIX HOLES HAVING DIAMETER OF 0.065" ± 0.001" AND ONE HOLE HAVING DIAMETER OF 0.150" ± 0.001". ALL HOLES HAVE DEPTH OF 0.265" ± 0.001". THE SIX 0.065" HOLES ARE ENLARGED BY 45° TAPER TO DEPTH OF 0.047". ALL HOLES ARE SPACED AT ANGLES OF 51°26' ± 5' ON CIRCLE DIAMETER OF 2.500" ± 0.015".

b. SIX STOPS HAVING HEIGHT OF 0.187" ± 0.001", CENTERED BETWEEN PIN HOLES, TO BEAR AGAINST FLAT AREAS OF BASE.

c. RIM EXTENDING OUT A MINIMUM OF 1/8" FROM 2-13/16" DIAMETER AND HAVING HEIGHT OF 0.126" ± 0.001".

d. NECK-CYLINDER CLEARANCE HOLE HAVING DIAMETER OF 2.200" ± 0.001".



ENLARGED BOTTOM VIEW

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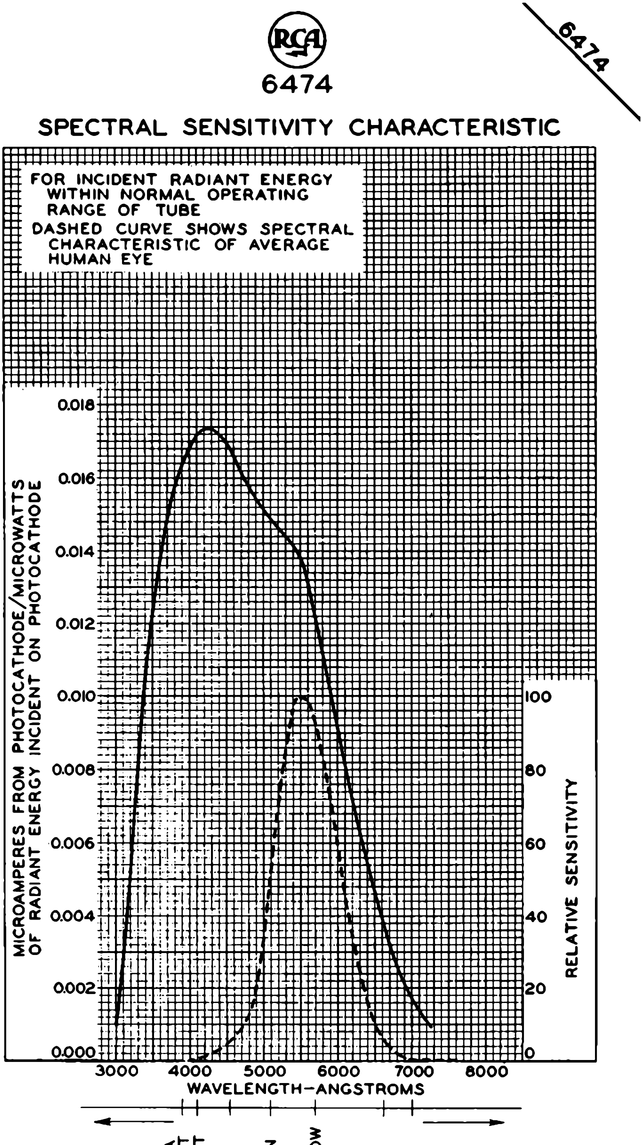
SPECTRAL SENSITIVITY CHARACTERISTIC



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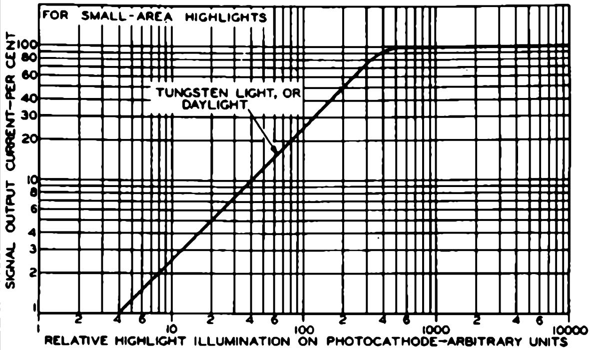
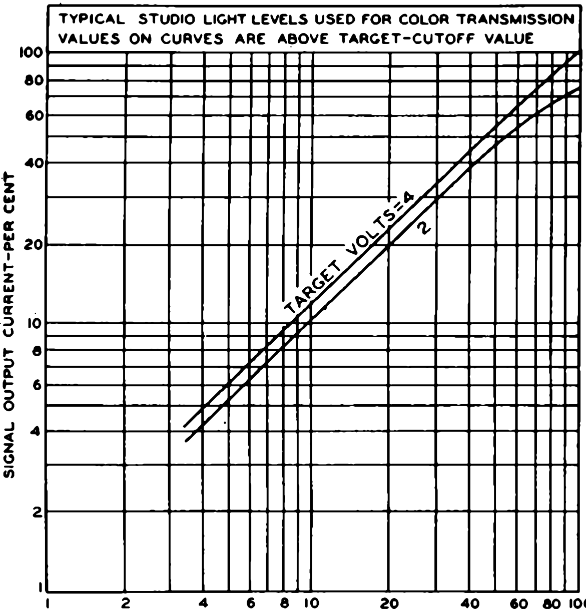
LIGHT TRANSFER CHARACTERISTICS



92CM-8283



92CS-8273

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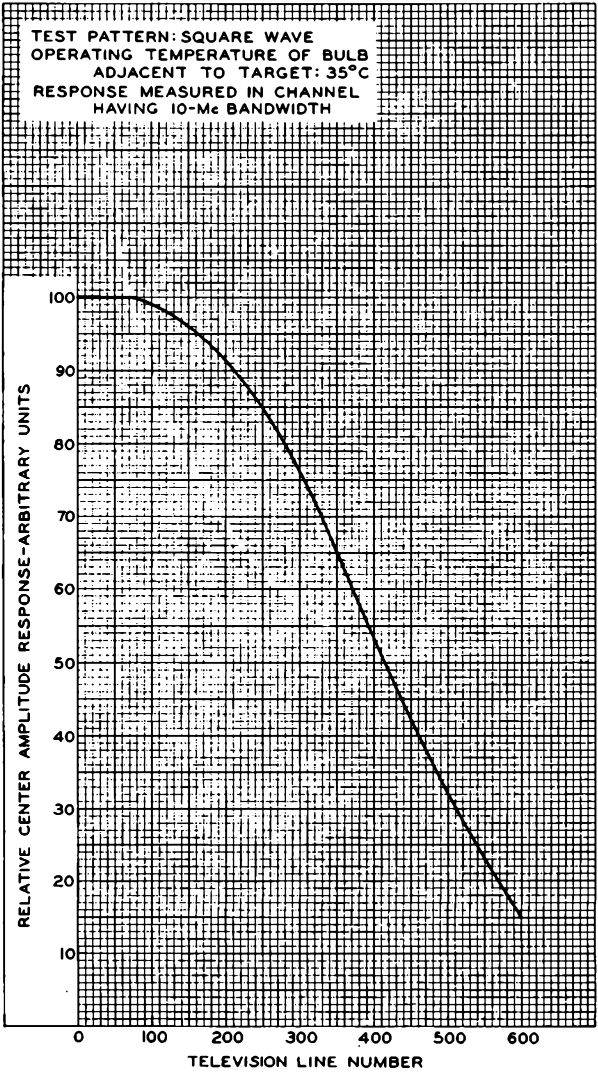
AMPLITUDE RESPONSE CHARACTERISTIC



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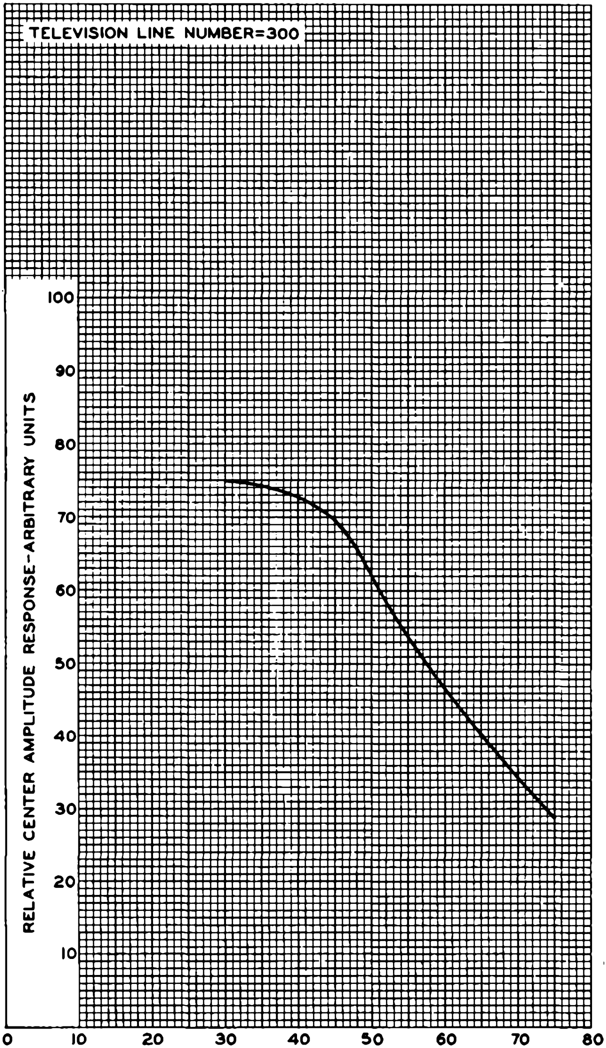
TEMPERATURE EFFECT ON AMPLITUDE RESPONSE



MAR.15,1954

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8272

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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

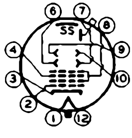
Mounting Position . . . . Center of tube face must be at same elevation as or at higher elevation than tube base.

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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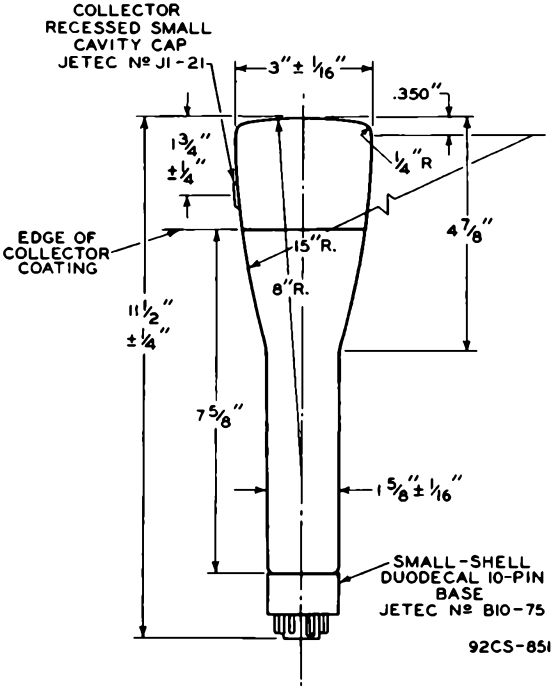
COMPUTER STORAGE TUBE



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° ± 3°.

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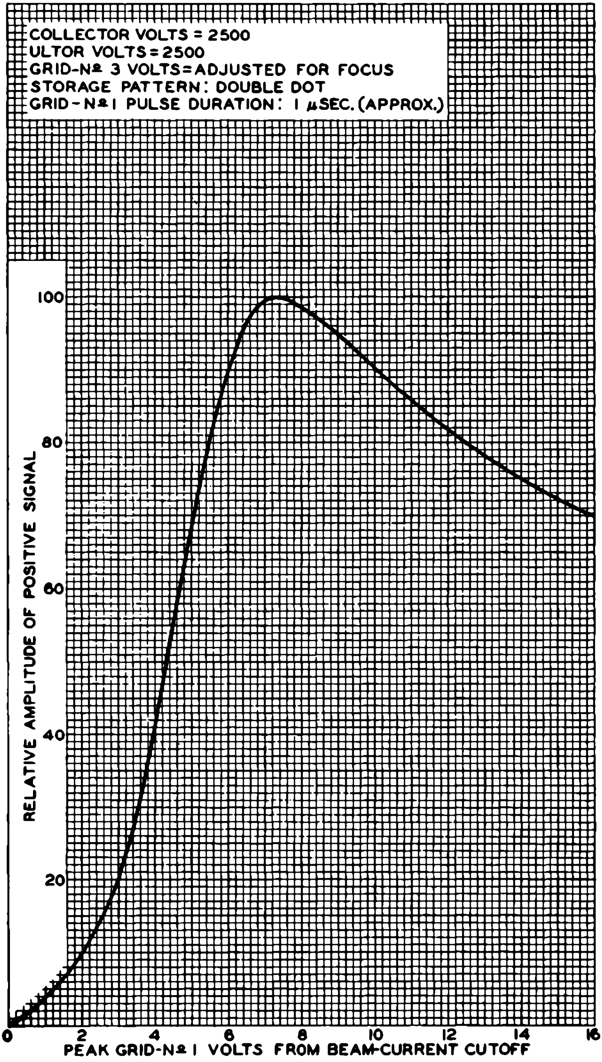
AVERAGE CHARACTERISTIC



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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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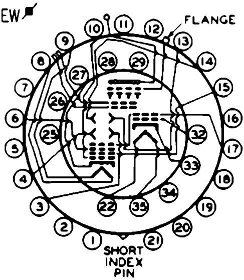
DISPLAY STORAGE TUBE

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		Viewing Section**	
		Equivalent Values		
GRID-No.4 VOLTAGE	2900 max.*	150 max.**	300 max.	volts
GRID-No.3 VOLTAGE	1000 max.*	-	300 max.	volts
GRID-No.2 VOLTAGE	2750 max.*	-	150 max.	volts
CATHODE VOLTAGE	-	-2900 max.**	-	volts
GRID-No.1 VOLTAGE:				
Negative bias value	200 max.*		100 max.	volts
Positive bias value	0 max.*		0 max.	volts
Positive peak value	2 max.*		0 max.	volts
PEAK VOLTAGE BETWEEN GRID No.4 AND ANY DEFLECTING ELECTRODE	500 max.		-	volts
PEAK HEATER-CATHODE VOLTAGE:				
Heater negative with respect to cathode	125 max.*		125 max.	volts
Heater positive with respect to cathode	125 max.*		125 max.	volts

VIEWING SECTION**

Operating Values and Typical Performance Characteristics:

Screen Voltage	5000	10000	10000	volts
DC Backing-Electrode Voltage	5	5	5	volts
Grid-No.4 Voltage	150	210	150	volts
Grid-No.3 Voltage#	25 to 125	50 to 150	25 to 125	volts
Grid-No.2 Voltage†#	50 to 75	70 to 105	50 to 75	volts
Grid-No.1 Voltage#	0 to -50	0 to -75	0 to -50	volts
Maximum Screen Current	350	600	350	µamp
Maximum Peak Backing-Electrode Current	1.5	2	1.5	ma
Maximum Grid-No.4 Current♣	2	3	2	ma
Maximum Grid-No.3 Current♣	1.5	2	1.5	ma
Maximum Cathode Current♣	3	4	3	ma
Writing Speed††	300000	300000	300000	in./sec
Number of Half-Tone Steps□	5	5	5	
Viewing Duration▲	40	20	40	sec
Maximum Erasing-Uniformity Factor□□	0.5	0.5	0.5	
Stored-Spot Diameter††	0.020	0.020	0.020	in.
Resolution⊕	50	50	50	lines/in.
Brightness♣♣	175	1750	950	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.

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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.

✤ Measured by shrinking-raster method 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.

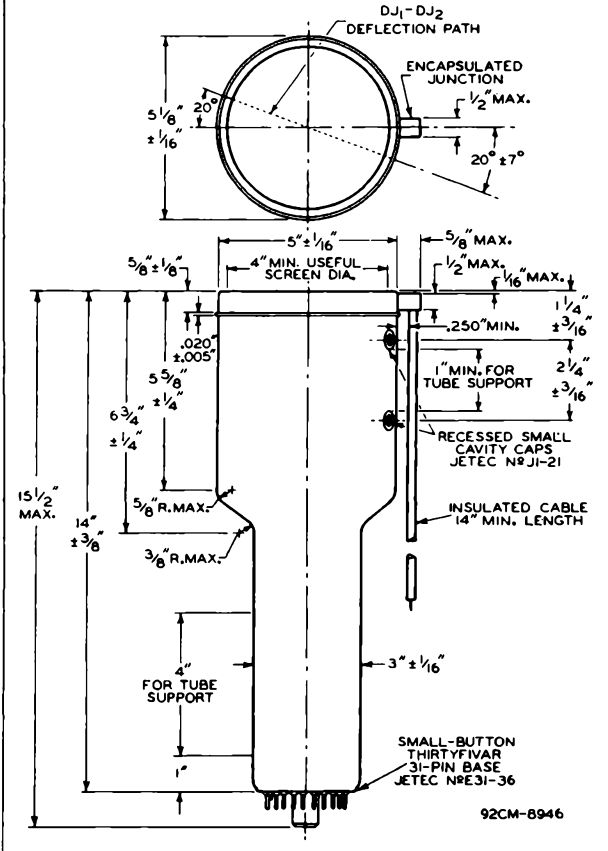
To prevent possible damage to the tube, allow the viewing-gun beam current to reach normal operating value before turning on the writing-gun beam current, and keep the viewing beam on until the writing beam is turned off.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6866

6866

DISPLAY STORAGE TUBE



CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 3° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF FACEPLATE.

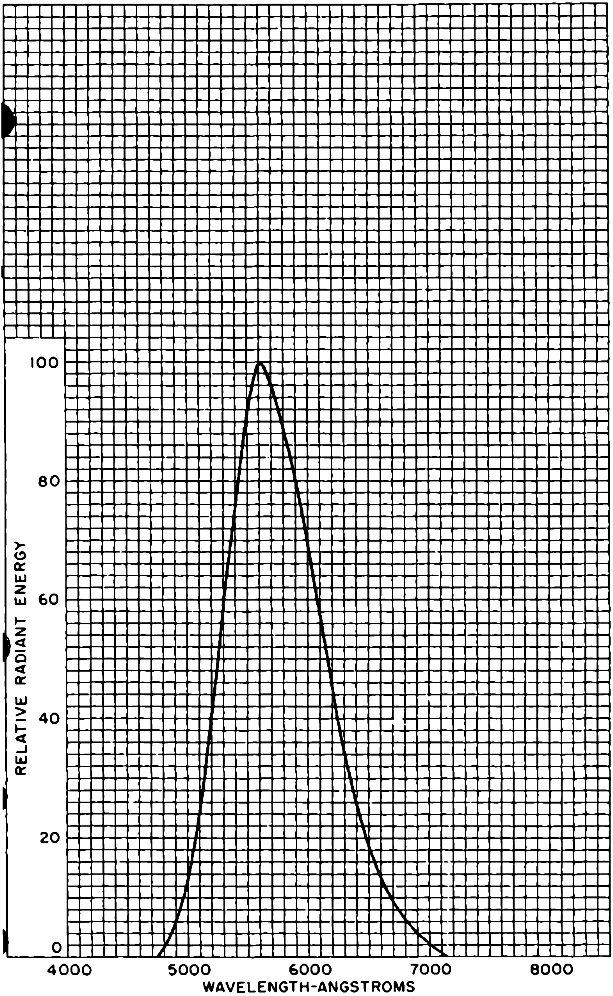
THE PLANE THROUGH TUBE AXIS AND EACH OF THE FOLLOWING ITEMS MAY VARY FROM THE DEFLECTION PATH PRODUCED BY DJ_1 AND DJ_2 BY THE FOLLOWING ANGULAR TOLERANCES (MEASURED ABOUT THE TUBE AXIS): PIN 27, ± 10°; EACH CAVITY CAP (ON SAME SIDE AS PIN 27), ± 17°; ENCAPSULATED JUNCTION, ± 10°. ANGLE BETWEEN DJ_1 – DJ_2 DEFLECTION PATH AND DJ_3 – DJ_4 DEFLECTION PATH IS 90° ± 3°.

![RCA logo]

6866

6866

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9042

6866

6866

AVERAGE CHARACTERISTIC

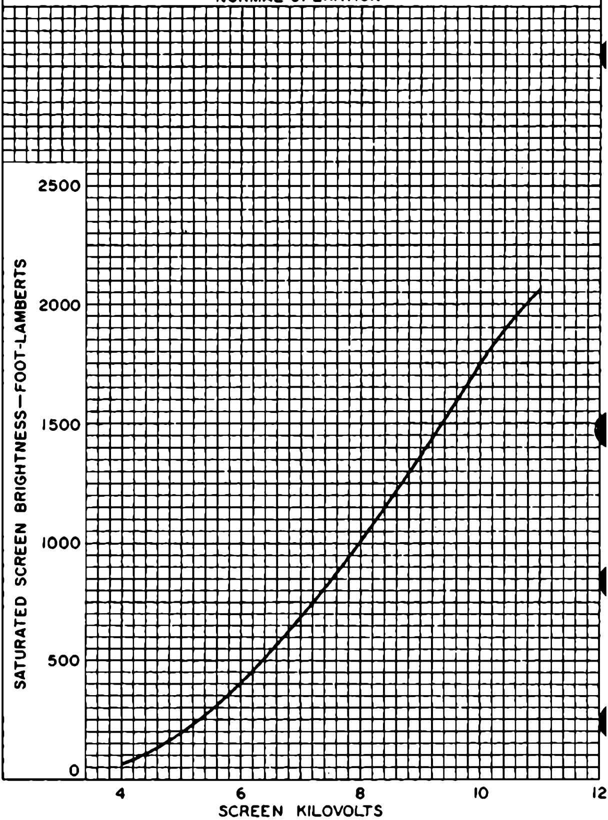
VIEWING SECTION

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



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9043

RCA

6866

AVERAGE CHARACTERISTICS

VIEWING SECTION

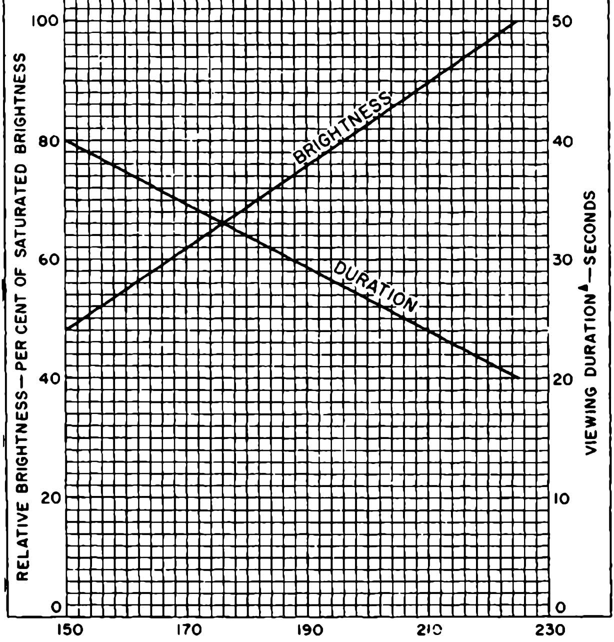
E_f = 6.3 VOLTS
SCREEN KILOVOLTS* = 5 TO 10
BACKING-ELECTRODE VOLTS* = 5
GRID-No 2 VOLTS* = 85
GRID-No 3 VOLTS* } ADJUSTED FOR BRIGHTEST,
GRID-No 1 VOLTS* } MOST UNIFORM DISPLAY

*REFERRED TO CATHODE OF VIEWING GUN

WRITING SECTION

NORMAL OPERATION

▲FOR EXPLANATION, SEE TABULATED DATA



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9044

RCA

6866

TYPICAL ERASURE CHARACTERISTICS

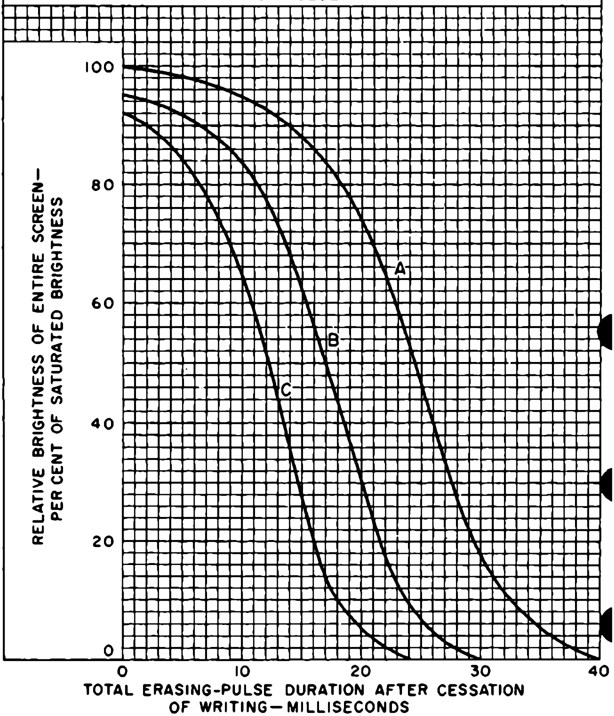
VIEWING SECTION

E_f = 6.3 VOLTS
SCREEN KILOVOLTS* = 10
GRID-No 4 VOLTS* = 210
GRID-No 2 VOLTS* = 85
GRID-No 3 VOLTS*, GRID-No 1 VOLTS*: ADJUSTED FOR BRIGHTEST, MOST UNIFORM DISPLAY

*REFERRED TO CATHODE OF VIEWING GUN

CURVE	BACKING-ELECTRODE VOLTS	
	DC	POSITIVE RECTANGULAR PULSE AMPLITUDE (APPROX.)
A	10	10
B	5	8
C	2	7

ERASURE IS PRODUCED BY POSITIVE RECTANGULAR PULSE APPLIED TO BACKING-ELECTRODE. INDICATED DURATION IS SUM OF DURATIONS OF NUMBER OF PULSES OR ELAPSED TIME AFTER START OF PULSE.



6866

RCA

6866

CURRENT CHARACTERISTIC
FOR WRITING GUN

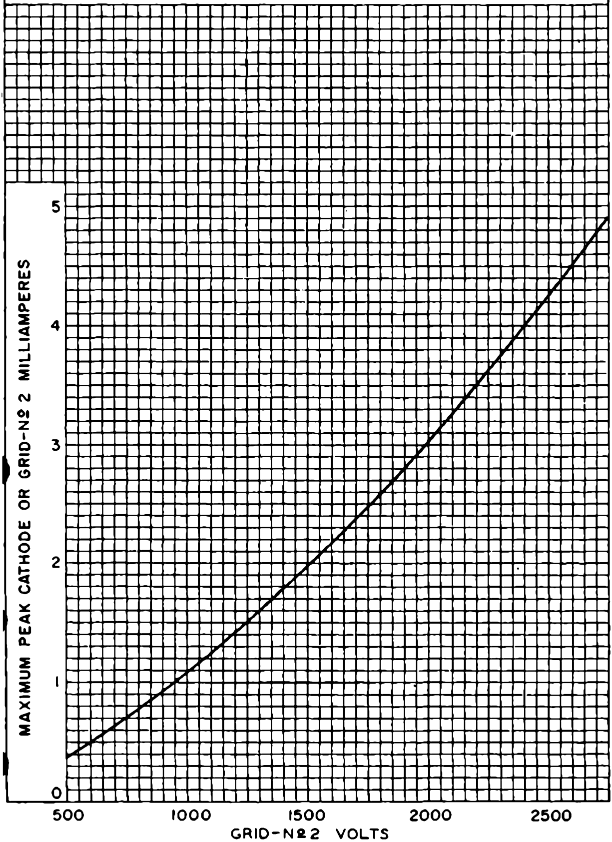
WRITING SECTION

E_f = 6.3 VOLTS
GRID-No 4 VOLTS* = GRID-NO. 2 VOLTS
GRID-No 3 VOLTS* = ADJUSTED FOR FOCUS
GRID-No 1 VOLTS* = 0

*REFERRED TO CATHODE OF WRITING GUN

VIEWING SECTION

NORMAL OPERATION



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9046

6866

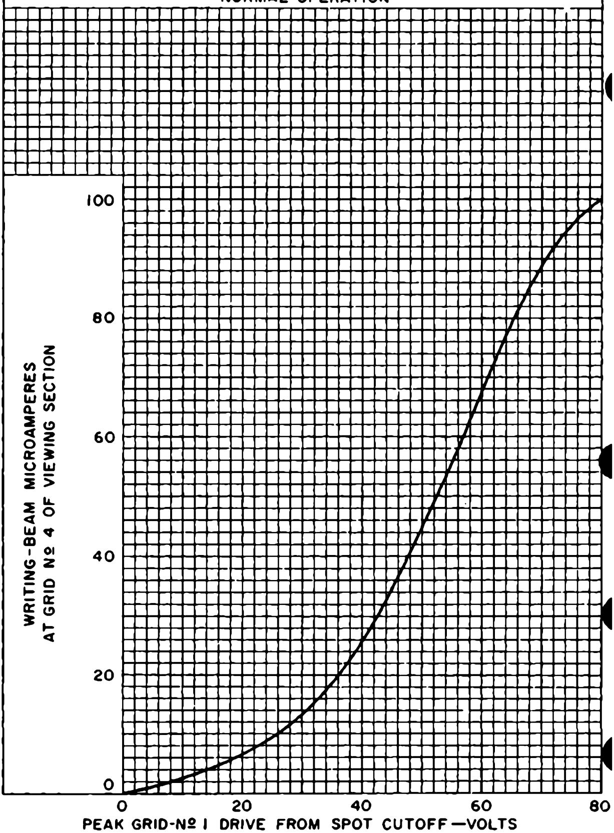
6866
TYPICAL DRIVE CHARACTERISTIC
FOR WRITING GUN

WRITING SECTION

E_f = 6.3 VOLTS
GRID-No. 4 VOLTS* = 2500
GRID-No. 3 VOLTS* = ADJUSTED FOR FOCUS
GRID-No. 2 VOLTS* = 2500
GRID-No. 1* BIASED TO SPOT CUTOFF
*REFERRED TO CATHODE OF WRITING GUN

VIEWING SECTION

NORMAL OPERATION



RCA TUBE HANDBOOK HB-3

PHOTOTUBE SECTION

This section contains data on RCA phototubes having a variety of spectral responses, shapes, and sizes. It includes both gas and vacuum single-unit types as well as multiplier types for diversified applications.

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

7-52

PRICES□

OF PHOTOTUBE TYPES

Type	Schedule D●	Schedule U▲
1P21	-	$ 50.00
1P22	-	14.75
1P28	-	15.50
1P29	-	2.95
1P37	-	2.85
1P39	-	1.75
1P40	-	1.90
1P41	-	2.80
1P42	-	5.70
868	-	2.50
917	-	3.50
918	-	3.10
919	-	3.50
920	-	4.15
921	$ 2.05	-
922	-	1.95
923♠	-	2.05
924♠	-	3.30
925	-	2.40
926	-	2.90
927	2.50	-
928	-	2.85
929	-	1.50
930	-	1.65
931-A	-	8.60
934	-	3.40
935	-	7.80
5581	-	2.25
5582	-	2.65
5583	-	3.05
5584	-	3.95
5652	-	6.55
5819	-	55.00
6199	-	55.00
6217	-	70.00

□ This price list applies only in the United States of America and is subject to change without notice. All prices are exclusive of all Federal, State and local excise, sales, and similar taxes.

▲ Schedule U shows user prices for tube types priced for distribution through other than dealer and service channels.

● Schedule D shows list prices for tube types priced for distribution through dealer and service channels.

♠ Not recommended for new equipment design.

INFORMATION ON PURCHASING ABOVE TYPES

Information as to where *RCA Phototube Types* can be purchased may be obtained from our *regional office* nearest you or from *Tube Department, Radio Corporation of America, Harrison, N.J.*

![RCA]

PHOTOTUBE 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.

Response	S-1	S-3	S-4	S-5	S-8	S-9	S-10	S-11
SINGLE-UNIT PHOTOTUBES								
Vacuum Types	917 919 922□ 925 6570‡	926□	1P39 929 934 5653	935		1P42●		
Gas Types	1P40 1P41● 868 918 921□ 923 924● 927 928* 930 6405/ 1640‡	1P29	1P37 5581 5582□ 5583					
TWIN PHOTOTUBES								
Vacuum Types			5652					
Gas Types	920		5584					
MULTIPLIER PHOTOTUBES								
Vacuum Types			1P21▲ 931-A▲ 6323§▲ 6328§▲ 6472§▲	1P28▲	1P22▲		6217●■	5819●■ 6199●■ 6342●■ 6372■ 6655●■ 6810●●

PHOTOCONDUCTIVE CELLS
See Semiconductor Device Section

□ Cartridge type.
‡ Low-microphonic type.
● Head-on type.
* Non-directional type.
§ For headlight-control service.
▲ 9-stage type.
■ 10-stage type.
● 14-stage type.

DEFINITIONS
OF PHOTOTUBE TERMS

Radiant Sensitivity. The quotient of output current by incident radiant power of a given wavelength, at constant electrode voltages.

Cathode Radiant Sensitivity. The quotient of current leaving the photocathode by incident radiant power of a given wavelength.

Luminous Sensitivity. The quotient of output current by incident luminous flux, at constant electrode voltages.

Cathode Luminous Sensitivity. The quotient of current leaving the photocathode by the incident luminous flux.

Current Amplification. Ratio of the output current to the photocathode current, at constant electrode voltages.

Equivalent Anode-Dark-Current Input. The quotient of the anode dark current by the luminous sensitivity.

Equivalent Noise Input. That value of incident luminous flux which when modulated in a stated manner produces an rms output current equal to the rms noise current within a specified bandwidth.

Electrode Dark Current. The electrode current which flows when there is no radiant flux incident on the photocathode.

Median. That value in a series such that half of the tubes in the series are on one side of it, and half on the other.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

PHOTOTUBE SENSITIVITY AND SENSITIVITY MEASUREMENTS

GENERAL CONSIDERATIONS

The range of luminous-sensitivity limits given for a phototube on the data sheets of this Section is that which the tube will display when operated under low-current conditions.

If the tube is to be operated under conditions approaching its maximum-current rating, the equipment design should provide for a wider sensitivity range having a minimum value equal to one-half of that shown for low-current operation. The sensitivity of a phototube under such high-current conditions is dependent upon the tube type; as follows:

1. Single-Unit and Twin Phototubes

a. **Gas Types:** For high-current operation, and particularly in applications in which the type is subjected to these higher values continuously, a drop in sensitivity below the values for low-current operation may be expected, the extent of the drop being affected by the severity of the operating conditions. After a period of idleness, a gas phototube usually recovers most of its initial sensitivity.

b. **Vacuum Types:** Unlike gas phototubes, this class of phototubes shows negligible drop in sensitivity values for different degrees of illumination and over long periods of use. The output current of a vacuum phototube is a linear function of the exciting illumination under normal operating conditions. The frequency response is flat up to frequencies at which transit-time effects become the limiting factor.

2. Multiplier Phototubes

Although RCA Multiplier Phototubes are vacuum types, a drop in sensitivity is to be expected from this class of phototubes when operated at high anode-current values. The extent of the drop is affected by the nature and severity of the operating conditions to which the tube is subjected. After a period of idleness, the multiplier phototube usually recovers a substantial percentage of this loss of sensitivity.

Multiplier-phototube-sensitivity values are dependent on the respective amplification of each dynode stage. Hence, large variations in sensitivity can be expected between individual tubes of a given type. The overall amplification of a multiplier phototube is equal to the average amplification per stage raised to the $\underline{n}$th power, where $\underline{n}$ is the number of stages. Thus, very small variations in amplification per stage produce very large changes in overall tube amplification.

Because these overall changes are very large, it is advisable for designers to provide adequate adjustment of the supply voltage per stage so as to be able to adjust the amplification of individual tubes to the desired design value. It is suggested that an overall voltage-adjustment

(continued on next page)

range of at least 2 to 1 be provided. When the output current can be controlled by change in the illumination of the photocathode of the multiplier phototube, the required range of adjustment in the voltage per stage can be reduced.

SENSITIVITY MEASUREMENTS

The luminous-sensitivity values shown on the data pages of this Section are measured according to the following procedures:

1. Single-Unit and Twin Phototubes

a. Gas Types: The light source consists of a tungsten lamp operating at a filament color temperature of 2870°K. For the 0-cycle measurements, a light input of 0.1 lumen is used, unless otherwise specified. For the 5000- and 10000 cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean. For all measurements, a dc anode-supply voltage of 90 volts and a 1.0-megohm load resistor are employed. Under these conditions, the effect of tube capacitance is negligible.

b. Vacuum Types: The light source consists of a tungsten lamp operating at a filament color temperature of 2870°K. A steady light input of 0.1 lumen is used, unless otherwise specified, together with a dc anode-supply voltage of 250 volts and a 1-megohm load resistor.

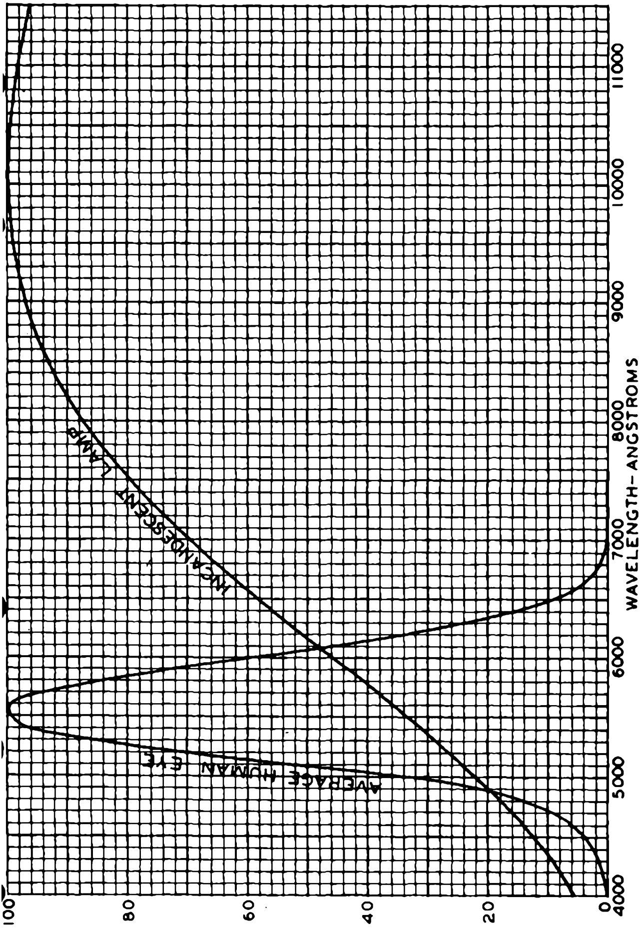
2. Multiplier Phototubes

The light source consists of a tungsten lamp operating at a filament color temperature of 2870°K. A light flux of 10 microlumens from a rectangular aperture approximately 0.8" long and 0.2" wide is projected normal to the cathode in the direction noted on the basing diagram and outline. The load resistor has a value of 0.01 megohm. The applied voltages are specified on the individual data sheets.

RCA

SPECTRAL CHARACTERISTIC OF HUMAN EYE & OF TUNGSTEN LAMP AT COLOR TEMPERATURE OF 2870 °K

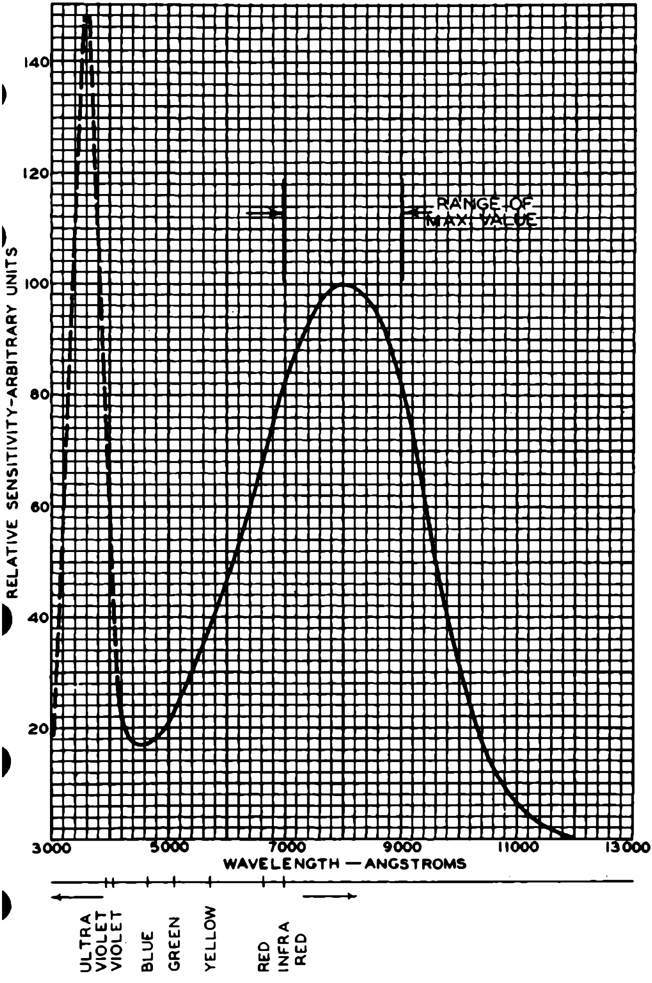
EYE CURVE IS ON BASIS OF EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



RELATIVE ENERGY DISTRIBUTION OF LAMP-ARBITRARY UNITS
RELATIVE SENSITIVITY OF EYE-ARBITRARY UNITS

SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-1 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



MAR.18,1946

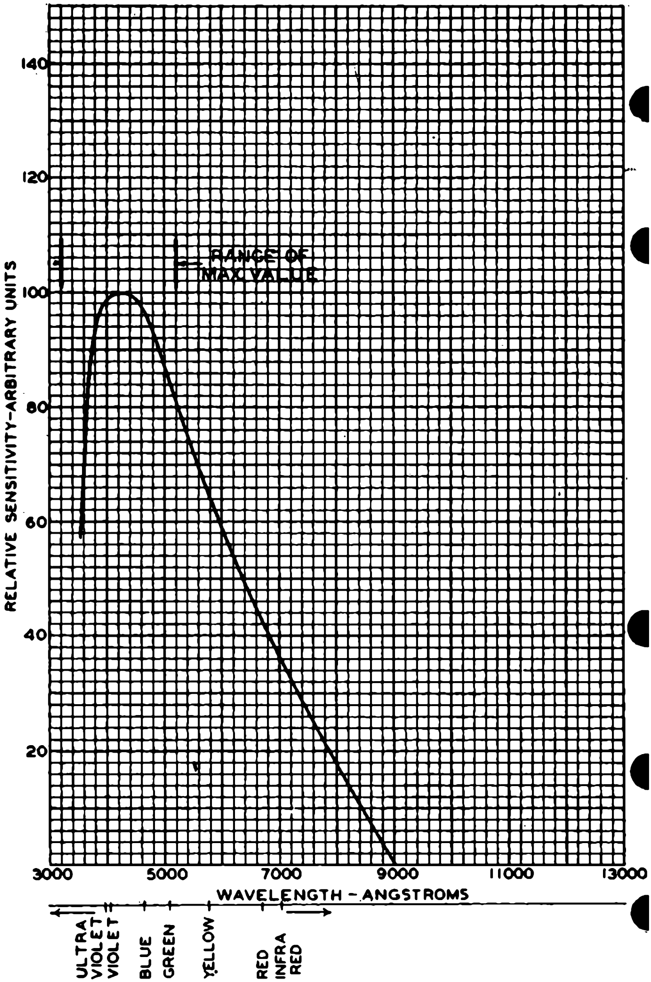
TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8056R5

SPECTRAL SENSITIVITY CHARACTERISTIC
OF PHOTOTUBE HAVING
S-3 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS

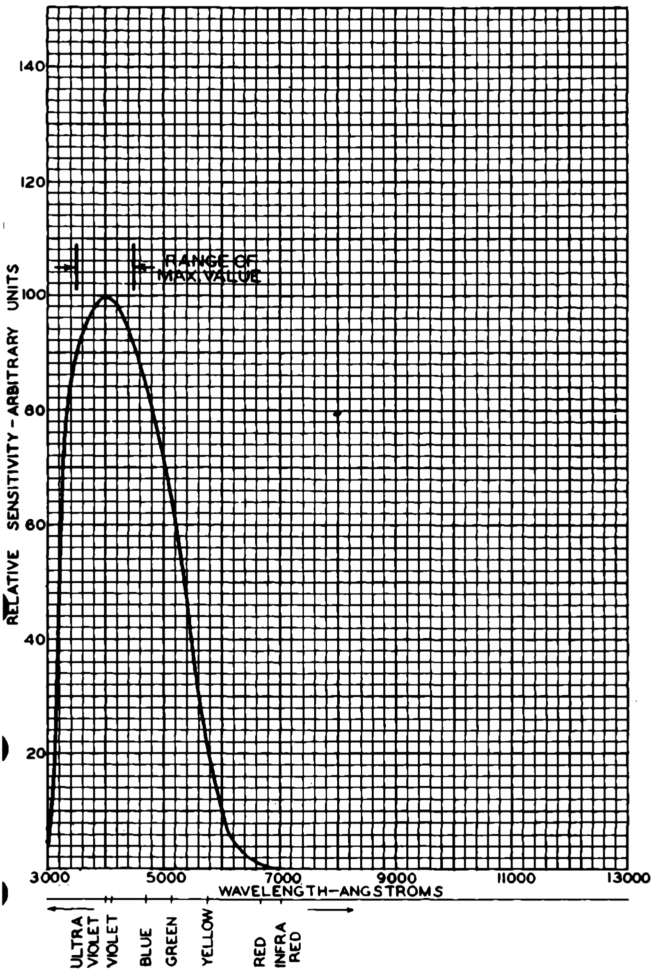


MAR. 21, 1946 TUBE DEPARTMENT 92CM-6057R6

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SPECTRAL SENSITIVITY CHARACTERISTIC
OF PHOTOTUBE HAVING
S-4 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



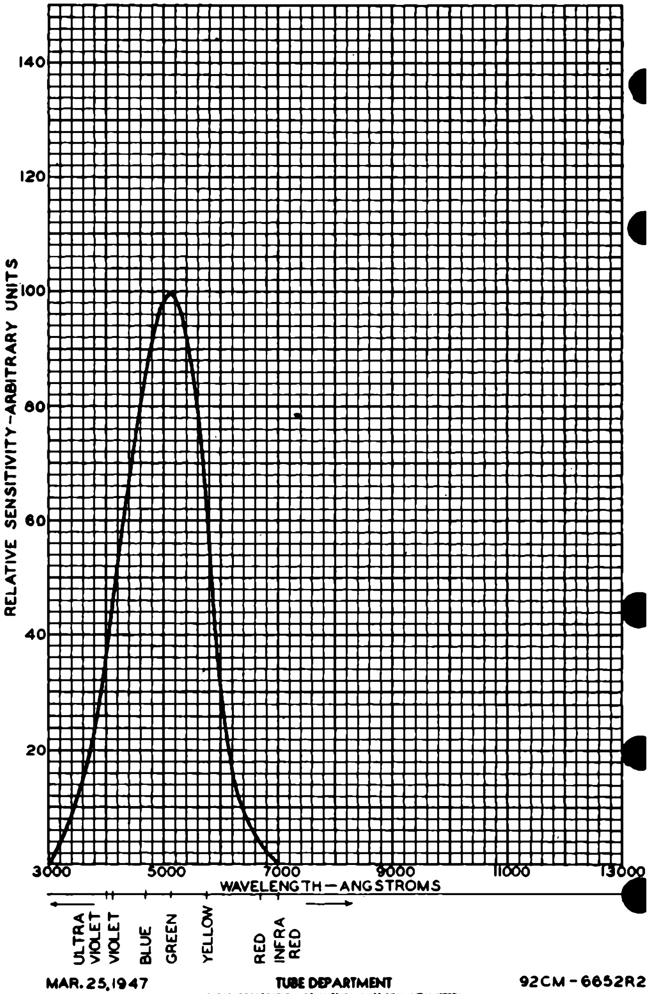
AUG. 12, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM - 6152R7

SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-4 RESPONSE

RADIANT FLUX FROM TUNGSTEN SOURCE AT 2870°K



MAR. 25, 1947

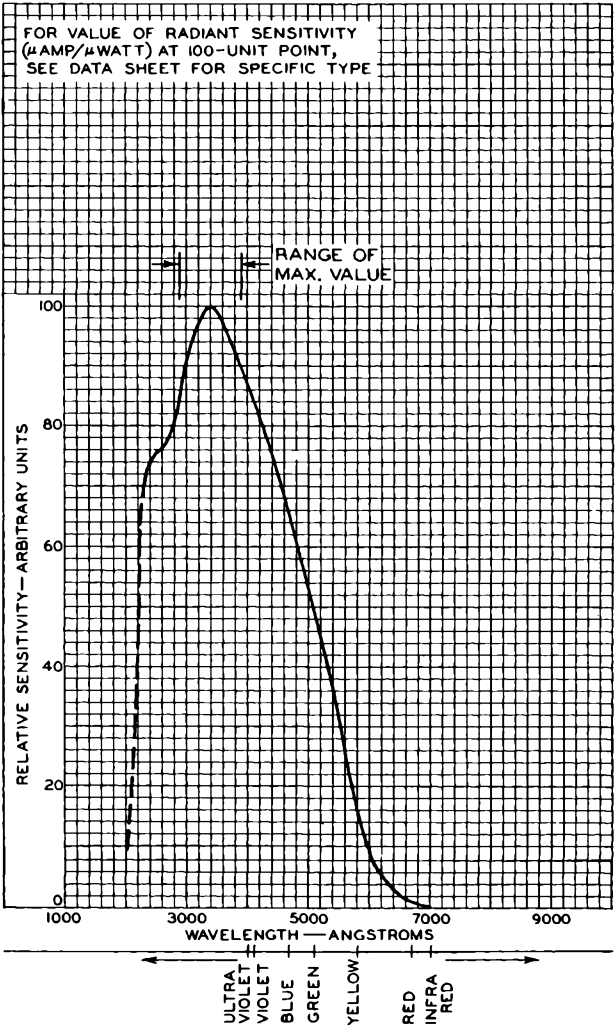
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6652R2

RCA

SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-5 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



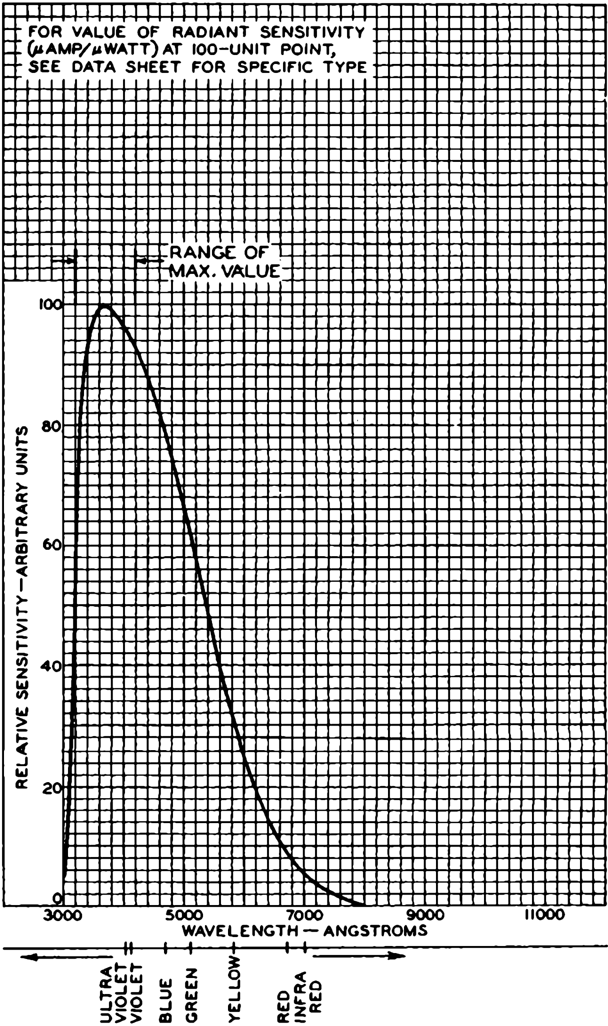
TUBE DIVISION

92CM-6814R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-8 RESPONSE

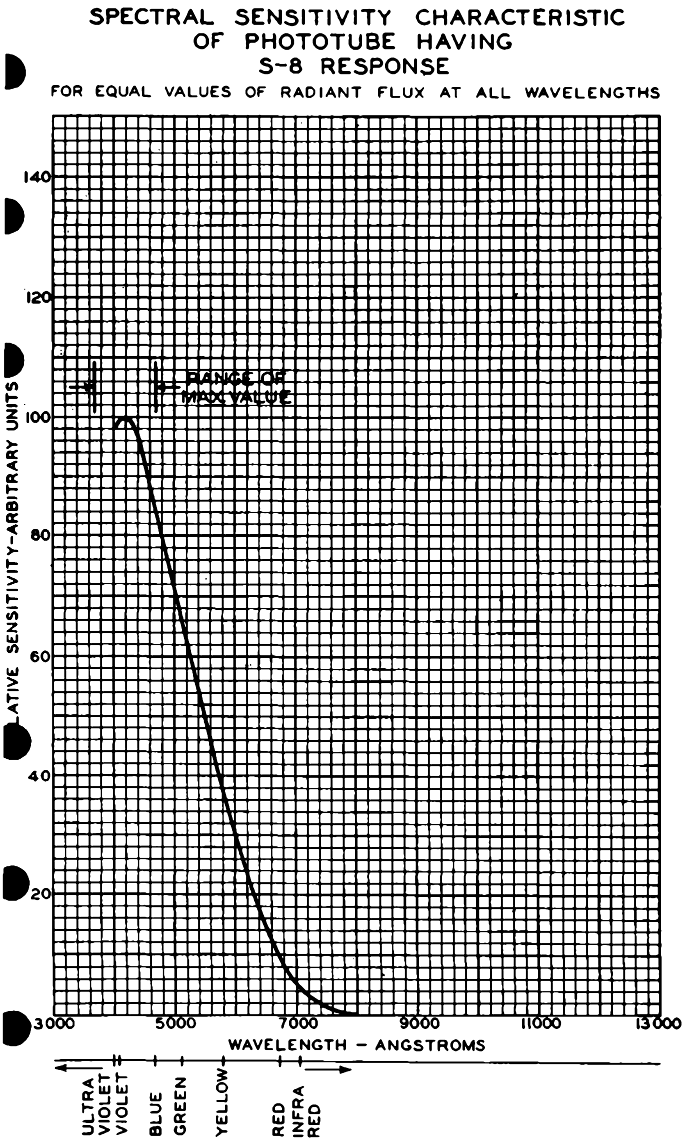
FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6592R2



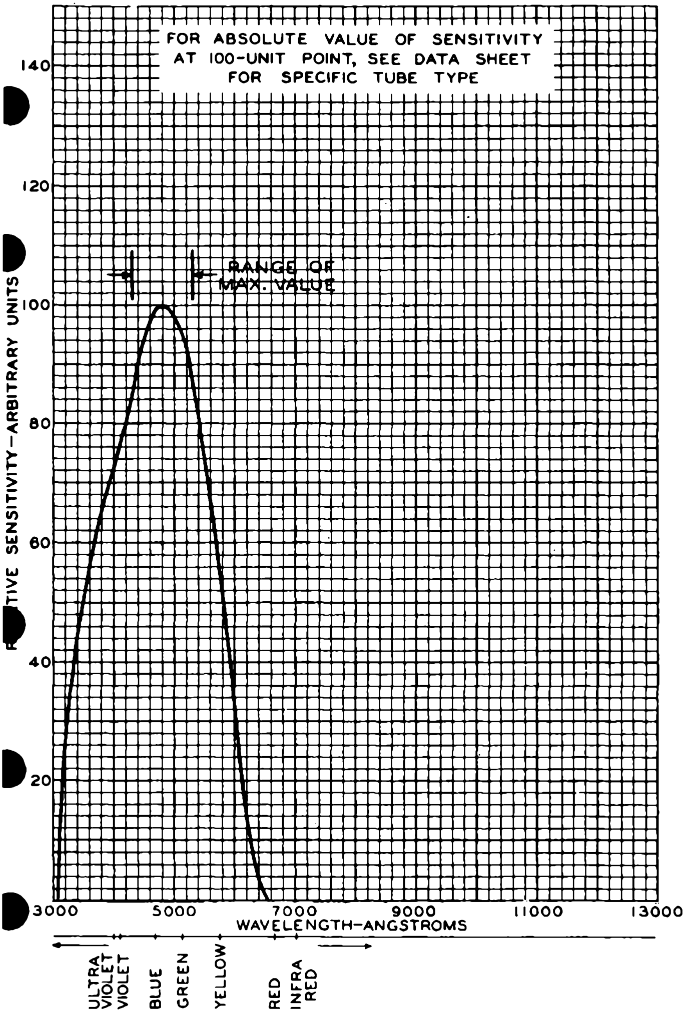
JULY 19, 1945

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6592R1

SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-9 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



NOV. 11 1952

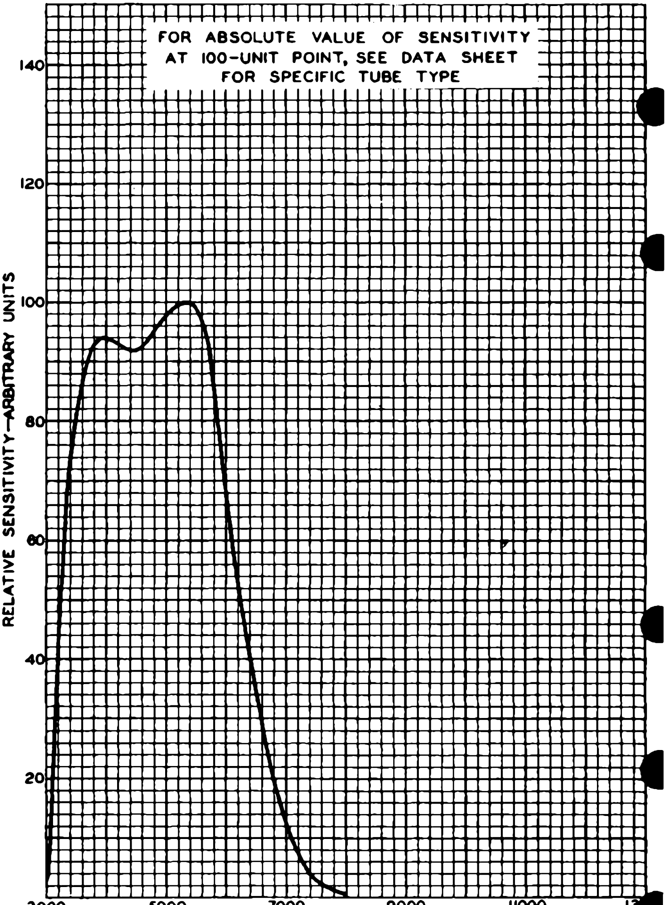
TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7274R1

SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-10 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



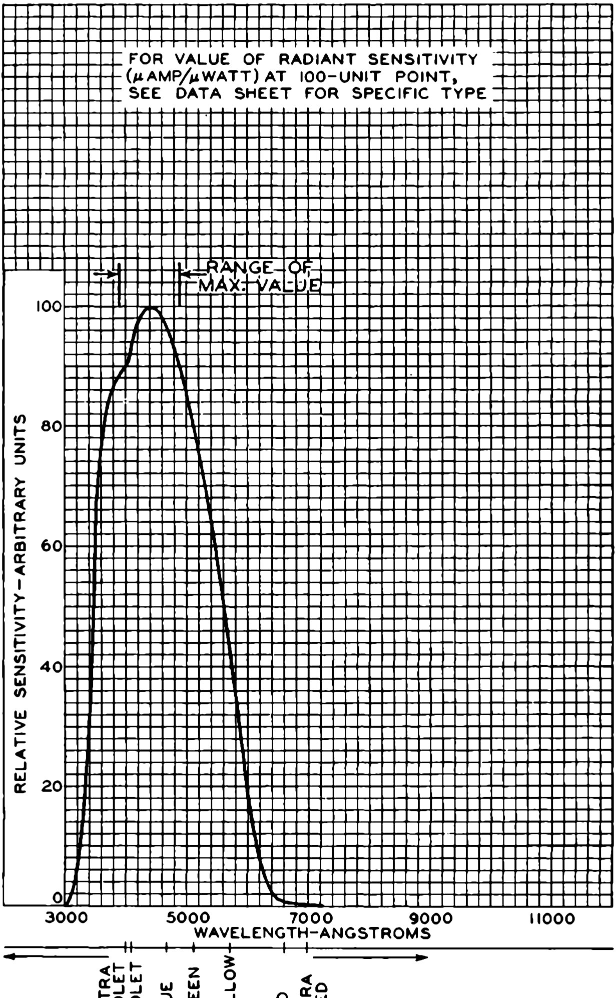
NOV. 11, 1952

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7821R1

SPECTRAL SENSITIVITY CHARACTERISTIC
OF PHOTOTUBE HAVING
S-11 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS



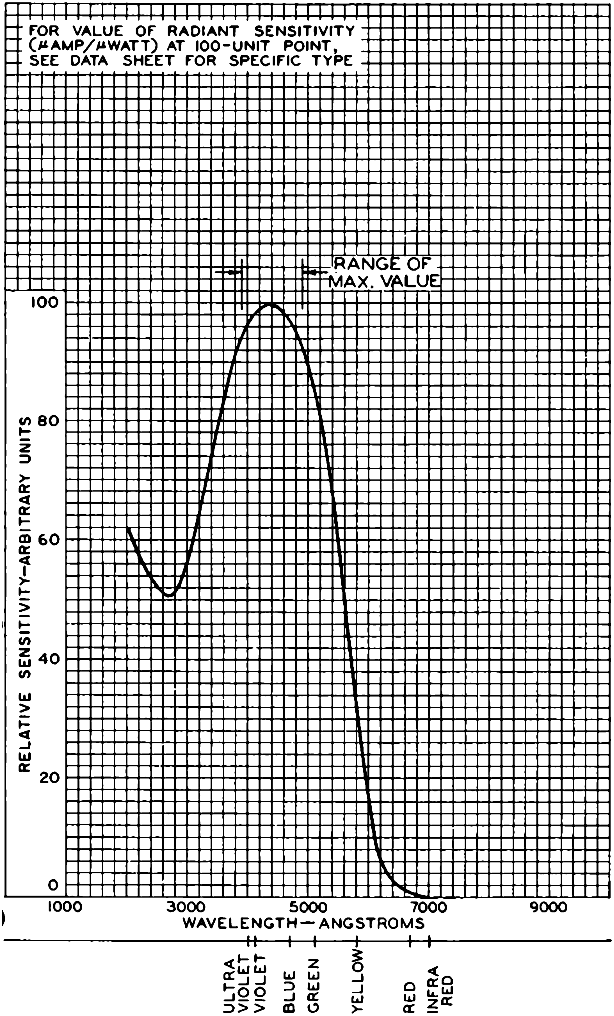
JULY 1, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8601R1

TENTATIVE SPECTRAL SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-13 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS

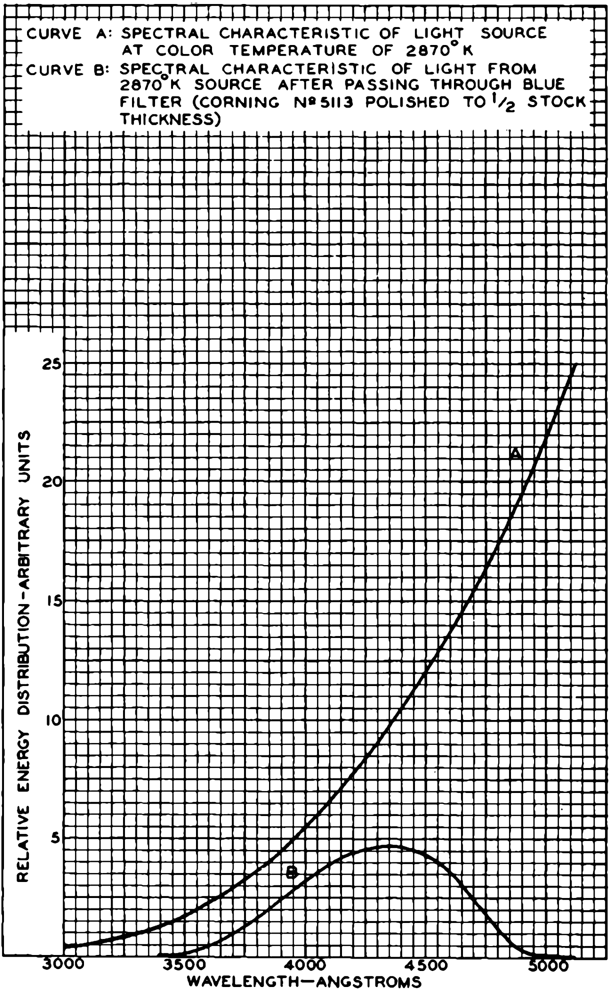


TUBE DIVISION

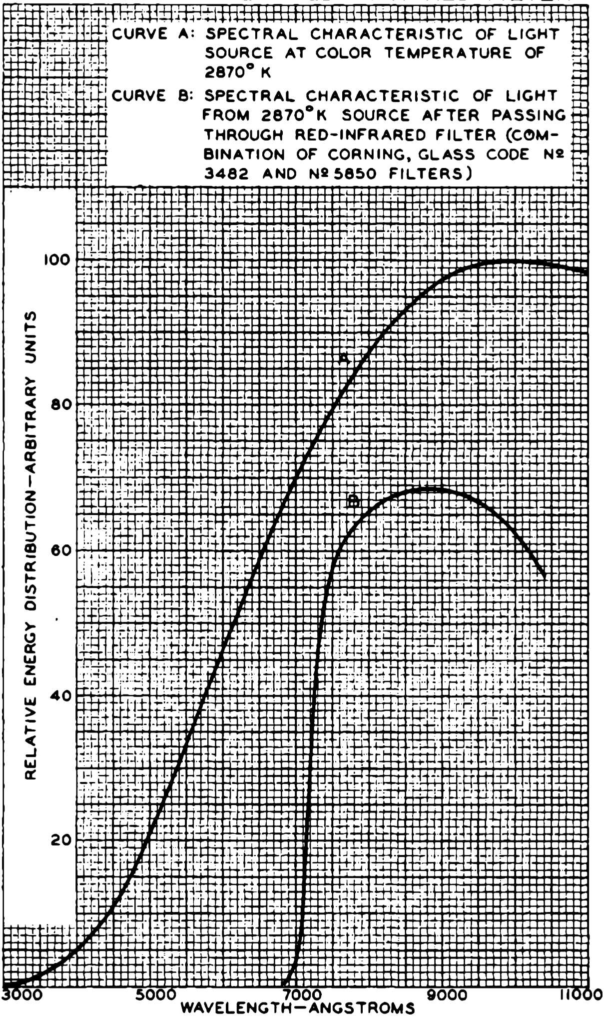
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9037

SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER



SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED RED-INFRARED FILTER



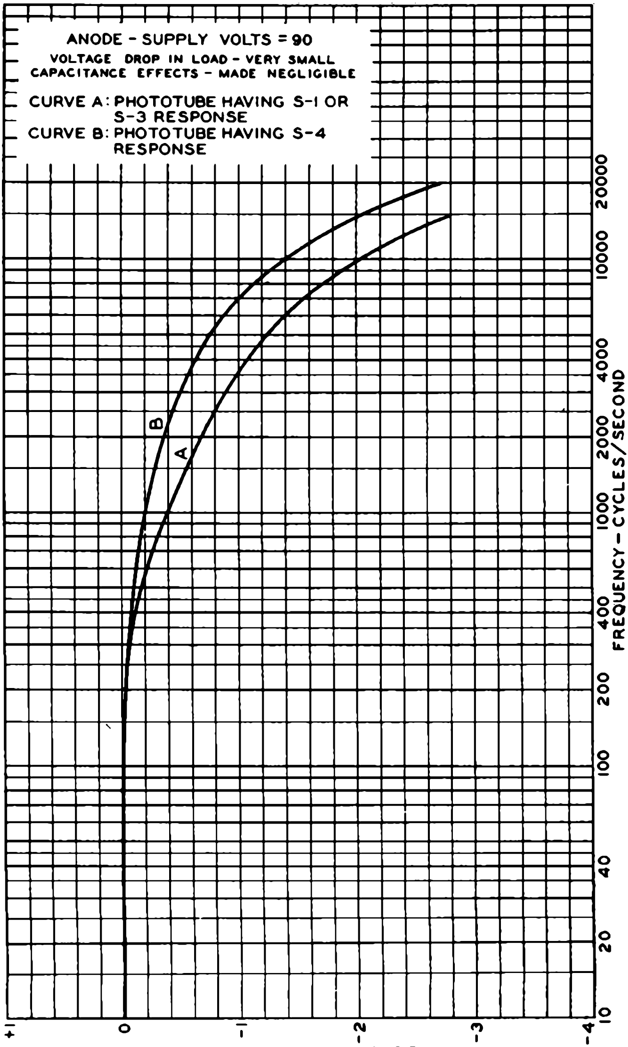
SEPT. 3, 1952

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7838

FREQUENCY-RESPONSE CHARACTERISTICS OF GAS PHOTOTUBES



APRIL 30,1947 TUBE DEPARTMENT 92CM-6864

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1P21

RCA

1P21
MULTIPLIER PHOTOTUBE
9-STAGE TYPE WITH S-4 RESPONSE

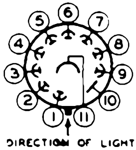
For applications involving very low light levels◆

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 μμf
Anode to All Other Electrodes	6.5 μμf
Maximum Overall Length	3-11/16"
Maximum Seated Length	3-1/8"
Seated Length to Center of Cathode	1-15/16" ± 3/32"
Maximum Diameter	1-5/16"
Bulb	T-9
Mounting Position	Any
Base	Small-Shell Submagnal 11-Pin, Non-Hygroscopic
Basing Designation for BOTTOM VIEW	11K

Pin 1 - Dynode No.1
Pin 2 - Dynode No.2
Pin 3 - Dynode No.3
Pin 4 - Dynode No.4
Pin 5 - Dynode No.5
Pin 6 - Dynode No.6



Pin 7 - Dynode No.7
Pin 8 - Dynode No.8
Pin 9 - Dynode No.9
Pin 10 - Anode
Pin 11 - Cathode

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
PEAK ANODE CURRENT	1 max.	ma
AVERAGE ANODE CURRENT○	0.1 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

Characteristics: ←

With 100 volts per dynode stage and 100 volts between dynode No.9 and anode⊕

	Min.	Av.	Max.	
Anode Dark Current#●	-	--	0.1	μamp
Sensitivity:				
At 4000 Angstroms	-	74000	-	μamp/μwatt
Luminous▲	40	80	-	amp/lumen
Current Amplification■	-	2000000	-	
Equivalent Noise Input★	-	5×10^{-13}	-	lumen

◆ For the more usual applications, the 931-A is recommended.

⊕ The use of about 50 volts between dynode No.9 and anode will give improved operating stability without sacrifice in sensitivity as explained in note under Type 931-A.

* On plane perpendicular to indicated direction of incident light.

□,○,#,●,▲,■,★: See next page.

←Indicates a change.

RCA

1P21
MULTIPLIER PHOTOTUBE

→ **Characteristics:**

With 75 volts per dynode stage and 50 volts between dynode No.9 and anode

	Av.	
Sensitivity:		
At 4000 Angstroms.	11000	μamp/μwatt
Luminous▲.	12	amp/lumen
Current Amplification■	300000	

□ Referred to cathode.

○ Averaged over any interval of 30 seconds maximum.

Dark current due to thermionic emission and ion feedback may be reduced by the use of refrigerants.

● For maximum signal-to-noise ratio, operation below 1000 volts is recommended.

▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY and MEASUREMENTS" at the front of this Section.

■ Ratio of anode sensitivity to cathode sensitivity.

★ Defined as the value where the rms output current is equal to the rms noise current determined under the following conditions: 100 volts per stage, 25°C tube temperature, bandwidth of 1 cycle per second, tungsten light source at 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OUTLINE DIMENSIONS for Type 1P21 are the same as those for Type 931-A

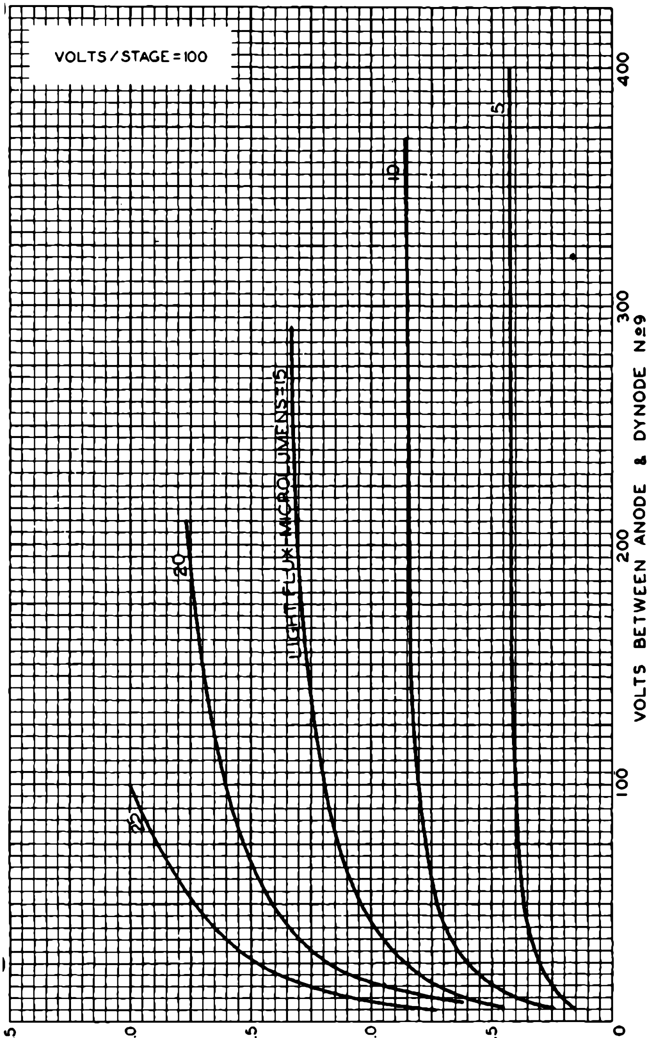
SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-4 Response is shown at the front of this Section

→ Indicates a change.

1P21

1P21

AVERAGE ANODE CHARACTERISTICS

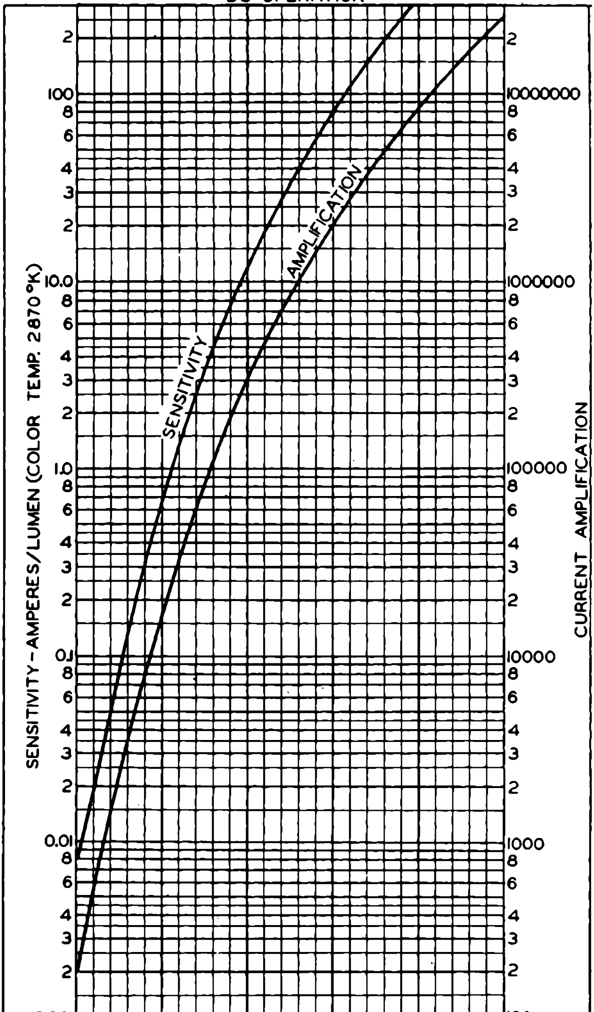


1P21

1P21

AVERAGE CHARACTERISTICS

DC OPERATION



OCT. 26, 1949

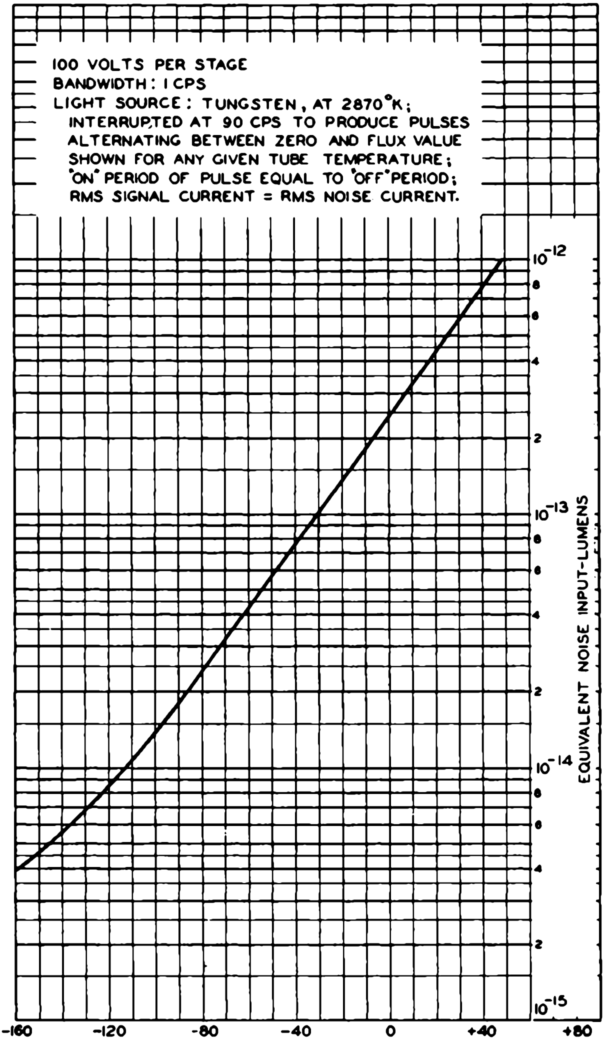
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-6454R2

RCA

1P21

EQUIVALENT-NOISE-INPUT CHARACTERISTIC



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1P22

1P22

MULTIPLIER PHOTOTUBE

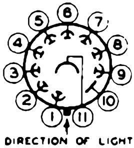
9-STAGE TYPE WITH S-8 RESPONSE

DATA

General:

Spectral Response	S-8
Wavelength of Maximum Response	4200 ± 500 angstroms ←
Cathode:	
Minimum Projected Length*	15/16"
Minimum Projected Width*	5/16"
Direct Interelectrode Capacitances:	
Anode to Dynode No. 9	4 $\mu\mu$f
Anode to All Other Electrodes	6.5 $\mu\mu$f
Maximum Overall Length.	3-11/16"
Maximum Seated Length	3-1/8"
Seated Length to Center of Cathode	1-15/16" ± 3/32"
Maximum Diameter.	1-5/16"
Bulb.	T-9
Mounting Position	Any
Base.	Small-Shell Submagnal 11-Pin, Non-Hygroscopic
Basing Designation for BOTTOM VIEW	11K

Pin 1- Dynode No.1
Pin 2- Dynode No.2
Pin 3- Dynode No.3
Pin 4- Dynode No.4
Pin 5- Dynode No.5
Pin 6- Dynode No.6



Pin 7- Dynode No.7
Pin 8- Dynode No.8
Pin 9- Dynode No.9
Pin 10- Anode
Pin 11- Cathode

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
PEAK ANODE CURRENT.	10 max.	ma ←
AVERAGE ANODE CURRENT○.	1 max.	ma ←
AMBIENT TEMPERATURE	50 max.	°C

Characteristics: ←

With 100 volts per dynode stage and 100 volts between dynode No.9 and anode⊕

	Min.	Av.	Max.	
Anode Dark Current#● . .	-	-	0.25	μamp
Sensitivity:				
At 4200 Angstroms . . .	-	370	-	μamp/μwatt
Luminous▲	0.115	0.6	50	amp/lumen
Current Amplification■ .	-	200000	-	
Luminous Detectivity★ . .	1×10^{-10}	-	-	lumen

⊕ The use of about 50 volts between dynode No.9 and anode will give improved operating stability without sacrifice in sensitivity as explained in note under Type 931-A.

* On plane perpendicular to indicated direction of incident light.

□ Referred to cathode.

○, #, ●, ▲, ■, ★: See next page.

← Indicates a change.

1P22

1P22
MULTIPLIER PHOTOTUBE

→ **Characteristics:**

With 75 volts per dynode stage
and 50 volts between dynode No. 9 and anode

	Av.	
Sensitivity:		
At 4200 Angstroms.	55	µamp/µwatt
Luminous▲	0.09	amp/lumen
Current Amplification■	30000	

° Averaged over any interval of 30 seconds maximum.

Dark current due to thermionic emission and ion feedback may be reduced by the use of refrigerants.

● For maximum signal-to-noise ratio, operation below 1000 volts is recommended.

▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY AND SENSITIVITY MEASUREMENTS" at the front of this Section.

■ Ratio of anode sensitivity to cathode sensitivity.

★ Defined as the value where the rms output current is equal to the rms noise current determined under the following conditions: 100 volts per stage, 25°C tube temperature, bandwidth of 1 cycle per second, tungsten light source at 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OUTLINE DIMENSIONS for Type 1P22
are the same as those for Type 931-A

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-8 Response
is shown at the front of this Section

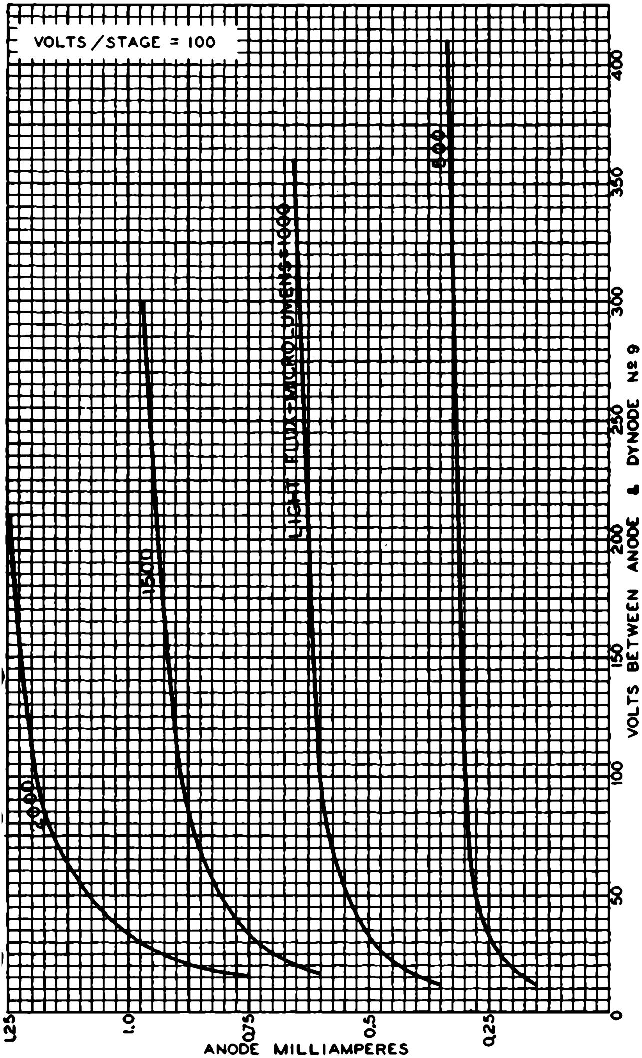
→ indicates a change.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

IP22

IP22

AVERAGE ANODE CHARACTERISTICS



MAR. 12, 1948

TUBE DEPARTMENT

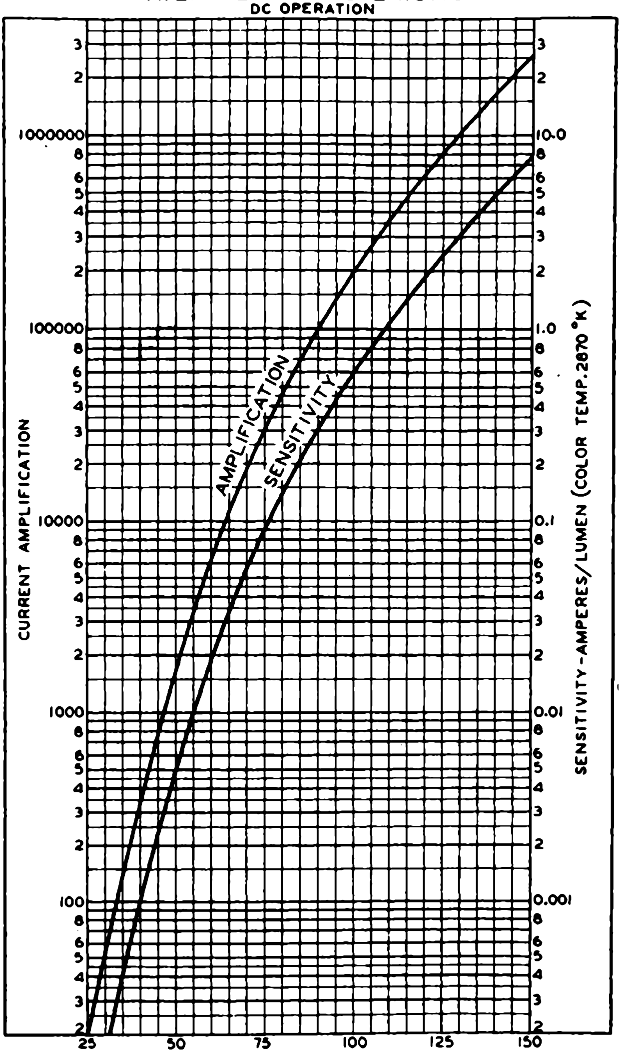
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6585R1

IP22

IP22

AVERAGE CHARACTERISTIC
DC OPERATION



JUNE 15, 1945

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6586

1P28

1P28
MULTIPLIER PHOTOTUBE

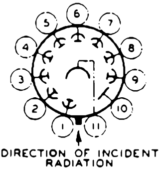
9-STAGE TYPE WITH S-5 RESPONSE

DATA

General:

Spectral Response S-5
Wavelength of Maximum Response. . . . . . 3400 ± 500 angstroms
Cathode:
  Minimum projected length* . . . . 15/16"
  Minimum projected width*. . . . . 5/16"
Direct Interelectrode Capacitances (Approx.):
  Anode to dynode No.9 . . . . 4.4 μμf
  Anode to all other dynodes. . . . . 6 μμf
Maximum Overall Length . . . . 3-11/16"
Maximum Seated Length . . . . 3-1/8"
Length from Base Seat to Center of
  Useful Cathode Area . . . . 1-5/16" ± 3/32"
Maximum Diameter . . . . 1-5/16"
Mounting Position . . . . Any
Weight (Approx.). . . . . 1.2 oz
Bulb T-9
Base. . . . . .Small-Shell Submagnal 11-Pin (JETEC No.B11-88), Non-hygroscopic
  Basing Designation for BOTTOM VIEW. 11K

Pin 1 - Dynode No.1
Pin 2 - Dynode No.2
Pin 3 - Dynode No.3
Pin 4 - Dynode No.4
Pin 5 - Dynode No.5
Pin 6 - Dynode No.6



Pin 7 - Dynode No.7
Pin 8 - Dynode No.8
Pin 9 - Dynode No.9
Pin 10 - Anode
Pin 11 - Cathode

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•.	0.5 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

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 (except as noted)

	Min.	*Median*	*Max.*	
Sensitivity:				
Radiant, at 3400 angstroms	-	61800	-	μamp/μwatt

* On plane perpendicular to the indicated direction of incident radiation.
• Averaged over any interval of 30 seconds maximum.

← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1P28

MULTIPLIER PHOTOTUBE

	Min.	Median	Max.	
Cathode radiant, at 3400 angstroms . .	-	0.050	-	μamp/μwatt
Luminous:♁				
At 0 cps	10	50	300	amp/lumen
At 100 Mc	-	47.5	-	amp/lumen
Cathode luminous▲. .	-	40	-	μamp/lumen
Current Amplification.	-	1,250,000	-	
Equivalent Anode-Dark-Current Input●■ . .	-	-	1.25×10^{-9}	lumen
Equivalent Noise Input:				
Luminous★.	-	7.5×10^{-13}	-	lumen
Ultraviolet†	-	8×10^{-16}	-	watt

With E = 750 volts (except as noted)

	Min.	Median	Max.	
Sensitivity:				
Radiant at 3400 angstroms.	-	7900	-	μamp/μwatt
Cathode radiant, at 3400 angstroms . .	-	0.050	-	μamp/μwatt
Luminous:♁				
At 0 cps	-	6.4	-	amp/lumen
Cathode luminous▲. .	-	40	-	μamp/lumen
Current Amplification.	-	160000	-	

♁ 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.

▲ For conditions the same as shown under (♁) except that the value of light flux is 0.01 lumen and 100 volts are applied between cathode and all other electrodes connected together as anode.

● Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

■ For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.

★ Under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier band-width of 1 cycle per second, tungsten light source at color temperature of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

† Determined under the same conditions as shown under (★) except that use is made of a monochromatic source having radiation at 2537 angstroms.

Curves showing
VARIATION IN SENSITIVITY OF PHOTOCATHODE for Type 1P28
are the same as those shown for Type 931-A

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-5 Response
is shown at the front of this Section

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1P28

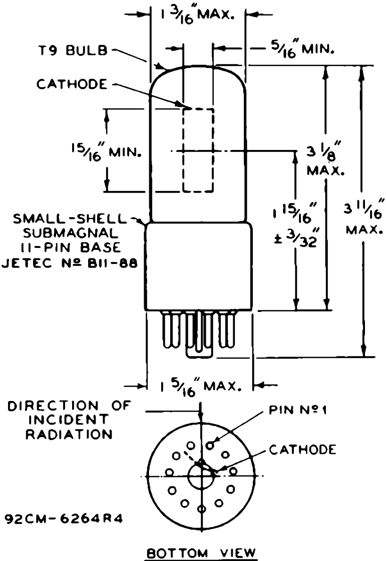
MULTIPLIER PHOTOTUBE

OPERATING CONSIDERATIONS

The *operating stability* of the 1P28 is dependent on the magnitude of the anode current and its duration. When the 1P28 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 1P28 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 0.5 milliampere is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 10 microamperes, and the tube should be given a warm-up period of about 1/2 hour under load conditions.

Electrostatic and/or *magnetic shielding* of the 1P28 may be necessary.



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

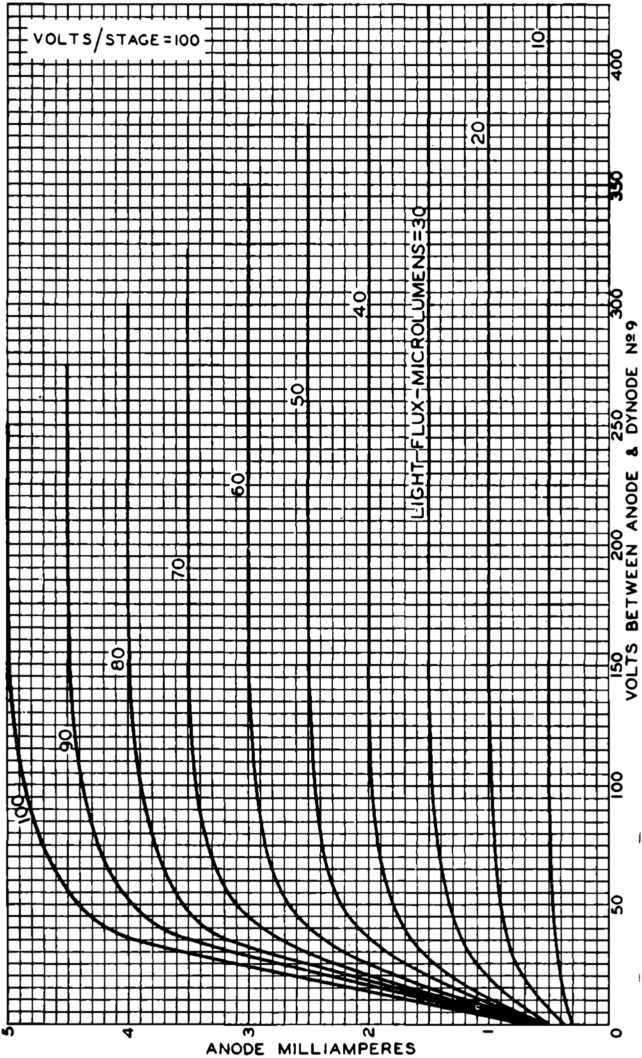
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1P28

RCA

1P28

AVERAGE ANODE CHARACTERISTICS



MAY 6, 1955

TUBE DIVISION

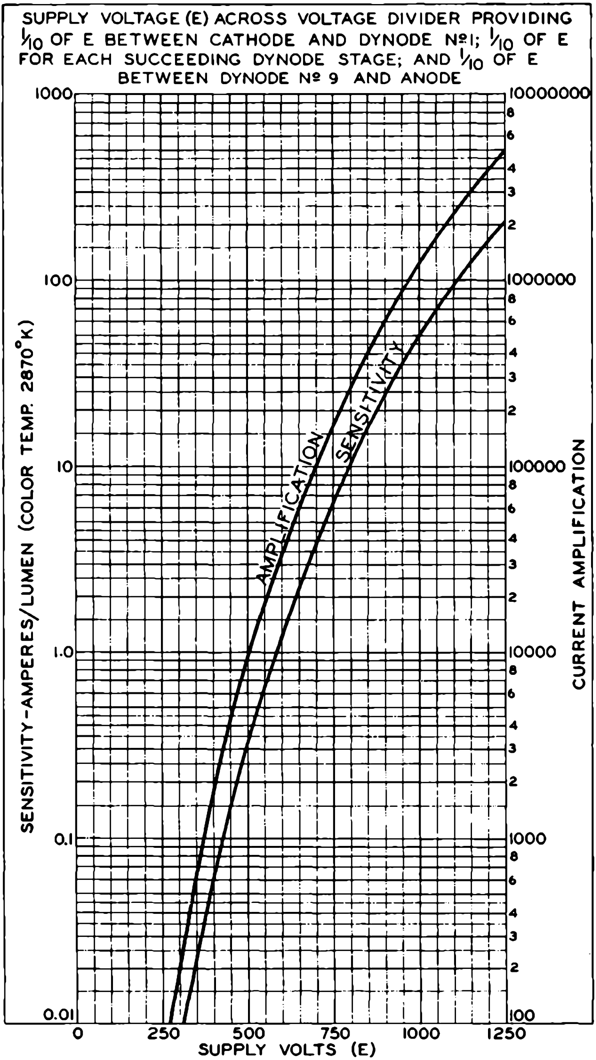
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6632R3

RCA

1P28

AVERAGE CHARACTERISTICS



MAY 5, 1955

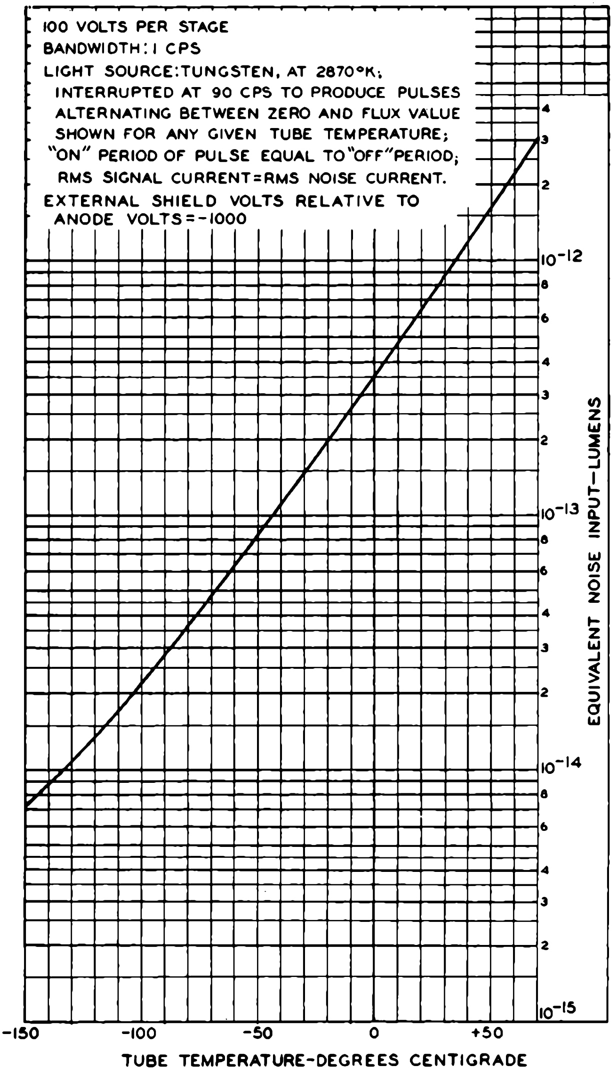
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-6547R3

IP28

IP28

EQUIVALENT-NOISE-INPUT CHARACTERISTIC



MAY 7, 1955 | TUBE DIVISION | 92CM-7503R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1P29

1P29
GAS PHOTOTUBE

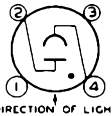
WITH S-3 RESPONSE

DATA

General:

Spectral Response	S-3
Wavelength of Maximum Response. . . .	4200 ± 1000 Angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	1-1/4" ←
Minimum Projected Width*.	5/8" ←
Direct Interelectrode Capacitance	3 μμf
Maximum Overall Length.	4-1/8"
Maximum Seated Length	3-1/2"
Seated Length to Center of Cathode.	2-1/8" ± 3/32"
Maximum Diameter.	1-1/8" ←
Bulb.	T-8
Mounting Position	Any
Base.	Dwarf-Shell Small 4-Pin ←
Basing Designation for BOTTOM VIEW.	2K

Pin 1 - No Connection
Pin 2 - Anode



DIRECTION OF LIGHT

Pin 3 - No Connection
Pin 4 - Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC). .	100 max. . . .	volts
PEAK CATHODE CURRENT.	20 max. . . .	μamp ←
PEAK CATHODE-CURRENT DENSITY.	100 max.	μamp/sq.in.
AVERAGE CATHODE CURRENT°	5 max. . . .	μamp ←
AMBIENT TEMPERATURE	100 max. . . .	°C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 90 Volts. .	-	-	0.10 . . .	μamp
Sensitivity:				
At 4200 Angstroms	-	0.01	-	μamp/μwatt
Luminous:				
At 0 Cycles	20	40	70	μamp/lumen ←
At 5000 Cycles.	-	35	-	μamp/lumen
At 10000 Cycles	-	31	-	μamp/lumen
Gas Amplification Factor. .	-	-	9	

* On plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.

← Indicates a change.

RCA

1P29

GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 80 volts or less:

→ For dc currents { above 5 μamp . . 0.1 . . . . megohm
below 5 μamp No Minimum

With anode-supply voltage of 100 volts:

→ For dc currents { above 3 μamp . . 2.5 . . . . megohms
below 3 μamp . . 0.1 . . . . megohm

OUTLINE DIMENSIONS for Type 1P29
are the same as those for Type 1P37

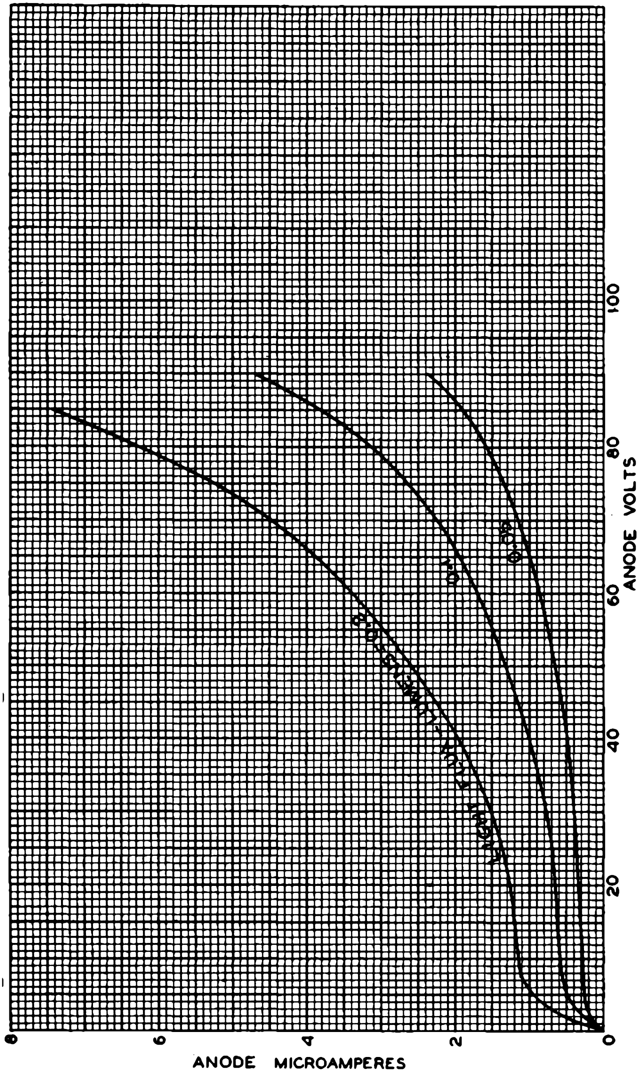
SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-3 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the beginning of this Section

→ Indicates a change.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

1P29

1P29
AVERAGE ANODE CHARACTERISTICS



AUG. 6, 1947

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM—6472R1

1P37

1P37

GAS PHOTOTUBE

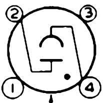
WITH S-4 RESPONSE

DATA

General:

Spectral Response	S-4
Wavelength of Maximum Response	4000 ± 500 Angstroms ←
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	1-1/4"
Minimum Projected Width*	5/8"
Direct Interelectrode Capacitance	3 μμf
Maximum Overall Length	4-1/8"
Maximum Seated Length	3-1/2"
Seated Length to Center of Cathode	2-1/8" ± 3/32"
Maximum Diameter	1-1/8"
Bulb	T-8
Mounting Position	Any
Base	Dwarf-Shell Small 4-Pin
Basing Designation for BOTTOM VIEW	2K

Pin 1 - No Connection
Pin 2 - Anode



DIRECTION OF LIGHT

Pin 3 - No Connection
Pin 4 - Cathode

Maximum Ratings, *Absolute Values*:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	100	max.	volts
PEAK CATHODE CURRENT	20	max.	μamp ←
PEAK CATHODE-CURRENT DENSITY	100	max.	μamp/sq.in. ←
AVERAGE CATHODE CURRENT°	5	max.	μamp
AMBIENT TEMPERATURE	75	max.	°C

Characteristics: ←

	Min.	*Av.*	*Max.*	
Dark Current at 90 Volts	-	-	0.05	μamp
Sensitivity:				
At 4000 Angstroms	-	0.125	-	μamp/μwatt
Luminous:				
At 0 Cycles	75	135	205	μamp/lumen
At 5000 Cycles	-	124	-	μamp/lumen
At 10000 Cycles	-	108	-	μamp/lumen
Gas Amplification Factor	-	-	5.5	

* On plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.

← Indicates a change.

RCA

1P37
GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 80 volts or less:

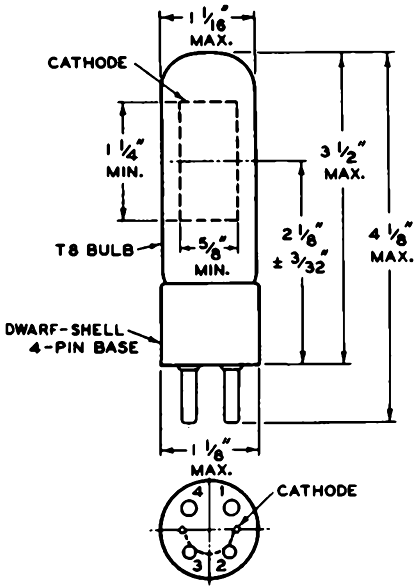
→ For dc currents	above 5 μamp	0.1	megohm
	below 5 μamp	No Minimum	

With anode-supply voltage of 100 volts:

For dc currents	above 3 μamp	2.5	megohms
	below 3 μamp	0.1	megohm

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the beginning of this Section

AVERAGE ANODE CHARACTERISTICS
of Type 1P37 are the same
as those shown under Type 5581



→ Indicates a change.

BOTTOM VIEW

92CM-470R4

1P39

VACUUM PHOTOTUBE

WITH S-4 RESPONSE

For applications critical as to leakage under high-humidity conditions

The 1P39 is like the 929, except that the 1P39 has a maximum dark current of 0.005 μa at 250 volts, and has a non-hygroscopic base which insures a value of resistance between anode and cathode pins about 10 times higher than conventional bases under adverse service conditions of high humidity. ←

← Indicates a change.

1P40

GAS PHOTOTUBE

WITH S-1 RESPONSE

For applications critical as to leakage under high-humidity conditions

The 1P40 is like the 930, except that the 1P40 has a maximum dark current of 0.005 μa at 90 volts, and has a non-hygroscopic base which insures a value of resistance between anode and cathode pins about 10 times higher than conventional bases under adverse service conditions of high humidity. ←

← Indicates a change.

![RCA]

1P41

GAS PHOTOTUBE

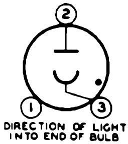
END TYPE WITH S-1 RESPONSE

DATA

General:

Spectral Response	S-1
Wavelength of Maximum Response. . . .	8000 ± 1000 angstroms
Cathode:	
Shape	Circular
Minimum Diameter.	9/16"
Direct Interelectrode Capacitance	1.8 $\mu\mu f$
Maximum Overall Length. . . . . ←	2-1/16"
Maximum Seated Length . . . . ←	1-19/32"
Maximum Diameter.	13/16"
Bulb.	T-6
Mounting Position	Any
Base.	Small-Shell Peewee 3-Pin
Basing Designation for BOTTOM VIEW	$2F_2$

Pin 1 - No Connection



Pin 2 - Anode
Pin 3 - Cathode

Maximum Ratings, *Absolute Values*:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	90 max. . . .	volts
PEAK CATHODE CURRENT.	5 max. . . .	μamp
PEAK CATHODE-CURRENT DENSITY. . . .	75 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	1.5 max. . . .	μamp
AMBIENT TEMPERATURE	100 max. . . .	°C

Characteristics:

	Min.	*Av.*	*Max.*	
DC Dark Current at 90 Volts:	-	-	0.1	μamp
Sensitivity:				
At 8000 angstroms	-	0.009	-	μamp/μwatt
Luminous:▲				
At 0 cps.	50	90	145	μamp/lumen
At 5000 cps	-	77	-	μamp/lumen
At 10000 cps.	-	67	-	μamp/lumen
Gas Amplification Factor. .	-	-	8.5	

° Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts.

▲ Measured with .06 lumen.

← Indicates a change.

1P41

GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

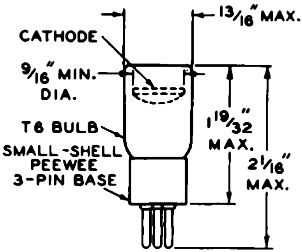
With anode-supply voltage of 70 volts or less:

For dc currents	above 1.5 μamp	0.1	megohm
	below 1.5 μamp	No Minimum	

With anode-supply voltage of 90 volts:

For dc currents	above 1.0 μamp	2.5	megohms
	below 1.0 μamp	0.1	megohm

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the front of this Section



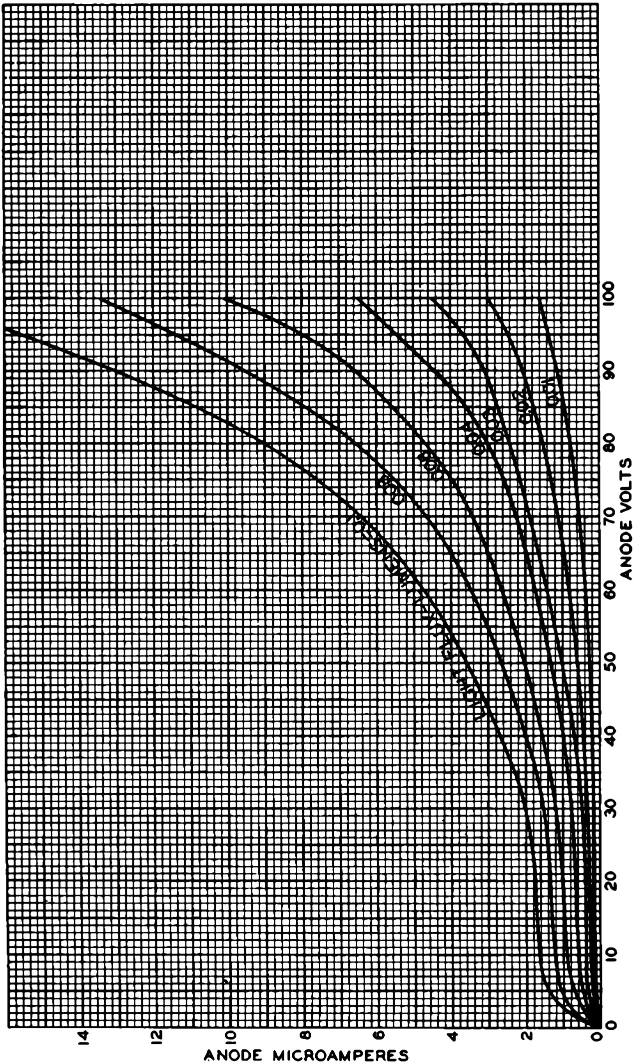
92CS-6676R1

→ Indicates a change.

1P41

1P41

AVERAGE ANODE CHARACTERISTICS



1P42

VACUUM PHOTOTUBE

END TYPE WITH S-9 RESPONSE

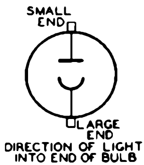
DATA

General:

Spectral Response	S-9 ←
Wavelength of Maximum Response	4800 ± 500 angstroms ←
Cathode:	
Shape	Circular
Window Area	0.030 sq. in.
Minimum Diameter	0.19"
Direct Interelectrode Capacitance	1.9 μμf ←
Overall Length	1-11/32" ± 1/16"
Maximum Diameter	1/4"
Bulb	T-2
Mounting Position	Any

TERMINAL CONNECTIONS

Small End: Anode



Large End: Cathode

Maximum Ratings, *Absolute Values*:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	180 max.	volts
PEAK CATHODE CURRENT	1.5 max.	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	0.4 max.	μamp
AMBIENT TEMPERATURE	75 max.	°C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 180 Volts	-	-	0.005	μamp
Sensitivity:				
At 4800 Angstroms	-	0.020	-	μamp/μwatt ←
Luminous▲	20	30	50	μamp/lumen ←

° Averaged over any interval of 30 seconds maximum.

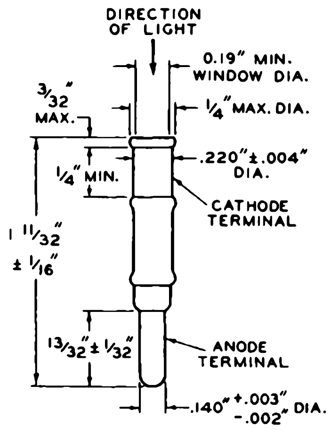
▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY and SENSITIVITY MEASUREMENTS", at the front of this Section, except that the anode supply is 180 volts and the light flux is 0.015 lumen.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-9 Response is shown at the front of this Section

← Indicates a change.

1P42

1P42
VACUUM PHOTOTUBE

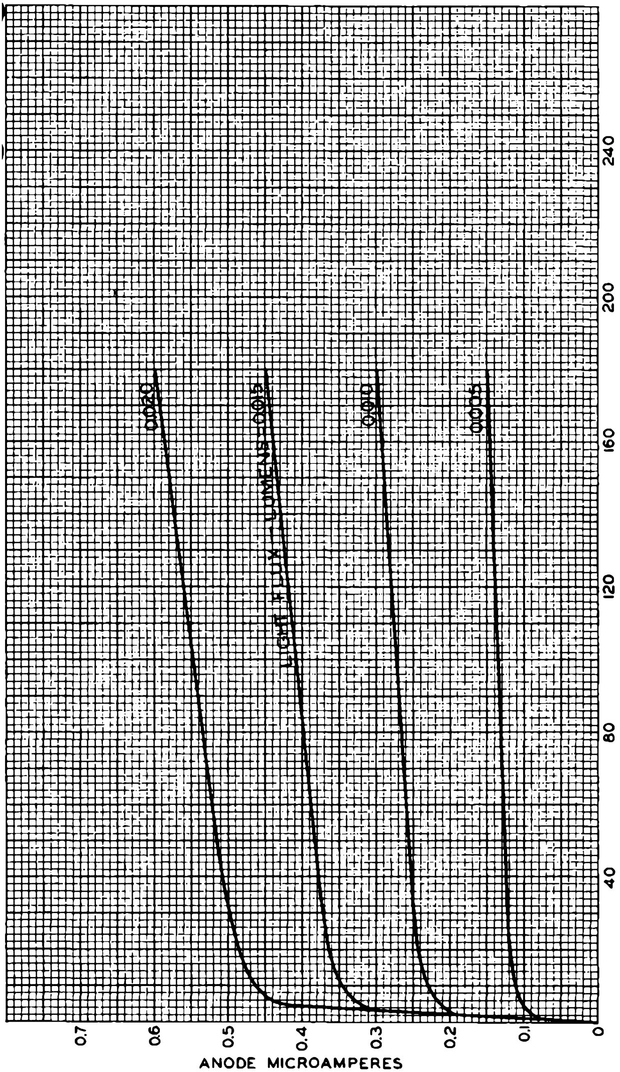


NOTE: WHEN TUBE IS ROTATED ABOUI THE LONGITUDINAL AXIS OF ITS CATHODE TERMINAL, NO PART OF THE ANODE TERMINAL WILL FALL OUTSIDE OF A 0.241"-DIAMETER CIRCLE CONCENTRIC WITH THE LONGITUDINAL AXIS OF THE CATHODE TERMINAL.

92CS-6791R2

1P42

AVERAGE ANODE CHARACTERISTICS



APRIL 7, 1950

92CM-6783R2

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

868
GAS PHOTOTUBE

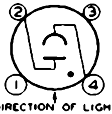
WITH S-1 RESPONSE

DATA

General: ←

Spectral Response	S-1
Wavelength of Maximum Response. . . .	8000 ± 1000 Angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	1-1/4"
Minimum Projected Width*.	5/8"
Direct Interelectrode Capacitance	3 μμf
Maximum Overall Length.	4-1/8"
Maximum Seated Length	3-1/2"
Seated Length to Center of Cathode.	2-1/8" ± 3/32"
Maximum Diameter.	1-1/8"
Bulb.	T-8
Mounting Position	Any
Base.	Dwarf-Shell Small 4-Pin
Basing Designation for BOTTOM VIEW.	2K

Pin 1 - No Connection
Pin 2 - Anode



Pin 3 - No Connection
Pin 4 - Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC).	100 max. . . .	volts
PEAK CATHODE CURRENT.	20 max. . . .	μamp
PEAK CATHODE-CURRENT DENSITY.	100 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	5 max. . . .	μamp
AMBIENT TEMPERATURE	100 max. . . .	°C

Characteristics: ←

	Min.	*Av.*	*Max.*	
Dark Current at 90 Volts. .	-	-	0.1 . . .	μamp
Sensitivity:				
At 8000 Angstroms	-	0.009	-	μamp/μwatt
Luminous:				
At 0 Cycles	50	90	145	μamp/lumen
At 5000 Cycles	-	77	-	μamp/lumen
At 10000 Cycles	-	67	-	μamp/lumen
Gas Amplification Factor. .	-	-	8	

* On plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.

← Indicates a change.

868
GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 80 volts or less:

→ For dc currents	above 5 μamp . .	0.1	megohm
	below 5 μamp . .	No Minimum	

With anode-supply voltage of 100 volts:

→ For dc currents	above 3 μamp . .	2.5	megohms
	below 3 μamp . .	0.1	megohm

OUTLINE DIMENSIONS for Type 868
are the same as those for Type 1P37

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the beginning of this Section

AVERAGE ANODE CHARACTERISTICS
of Type 868 are the same
as those shown under Type 1P41

→ Indicates a change.

917

917
VACUUM PHOTOTUBE

LOW-LEAKAGE TYPE WITH ANODE-TERMINAL CAP AND S-1 RESPONSE

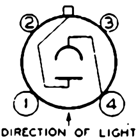
For light-measuring and relay applications

DATA

General:

Spectral Response	S-1
Wavelength of Maximum Response	8000 ± 1000 angstroms
Cathode:	
Shape	Semicylindrical
Minimum projected length*	1-9/16"
Minimum projected width*	5/8"
Direct Interelectrode Capacitance	2.2 μμf
Maximum Overall Length	4-7/16"
Seated Length	3-11/16" ± 1/8"
Seated Length to Center of Cathode	2-1/8" ± 3/32"
Maximum Diameter	1-1/8"
Mounting Position	Any
Weight (Approx.)	1.1 oz
Bulb	T-8
Cap	Small (JETEC No.C1-1)
Base	Dwarf-Shell Small 4-Pin (JETEC No.A4-26)
Basing Designation for BOTTOM VIEW	1A

Pin 1 – No Connection
Pin 2 – No Connection



Pin 3 – No Connection
Pin 4 – Cathode
Cap – Anode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	500 max.	volts
AVERAGE CATHODE-CURRENT DENSITY°	30 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	10 max.	μamp
AMBIENT TEMPERATURE	100 max.	°C

Characteristics, ***At 250 Volts on Anode:***

	Min.	*Median*	*Max.*	
Sensitivity:				
Radiant, at 8000 angstroms	–	0.0018	–	μamp/μwatt
Luminous▲	12	20	40	μamp/lumen
Anode Dark Current at 25°C	–	–	0.005	μamp

* On plane perpendicular to indicated direction of incident light.

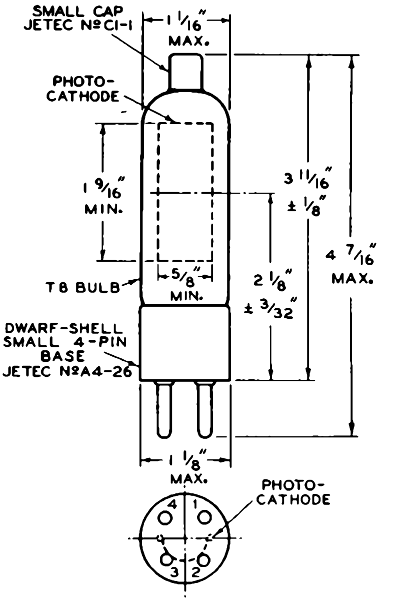
° Averaged over any interval of 30 seconds maximum.

▲ For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A dc anode supply of 250 volts, a 1-megohm load resistor, and a light input of 0.1 lumen are used.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-1 Response is shown at front of this Section

← Indicates a change.

917
VACUUM PHOTOTUBE



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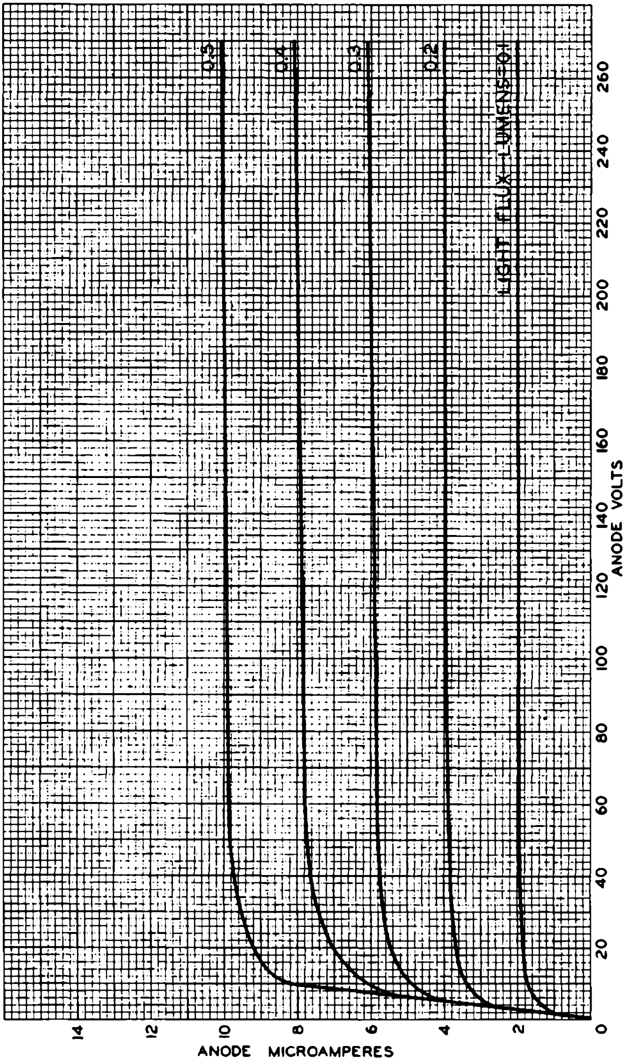
RCA

917

AVERAGE ANODE CHARACTERISTICS



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92CM-4360R2

918

918
GAS PHOTOTUBE

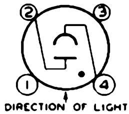
WITH S-1 RESPONSE

DATA

General:

Spectral Response	S-1
Wavelength of Maximum Response	8000 ± 1000 Angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	1-1/4"
Minimum Projected Width*	5/8"
Direct Interelectrode Capacitance	3 μμf
Maximum Overall Length	4-1/8"
Maximum Seated Length	3-1/2"
Seated Length to Center of Cathode	2-1/8" ± 3/32"
Maximum Diameter	1-1/8"
Bulb	T-8
Mounting Position	Any
Base	Dwarf-Shell Small 4-Pin
Basing Designation for BOTTOM VIEW	2K

Pin 1 - No Connection
Pin 2 - Anode



Pin 3 - No Connection
Pin 4 - Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	90 max.	volts
PEAK CATHODE CURRENT	20 max.	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq.in.
AVERAGE CATHODE CURRENT°	5 max.	μamp
AMBIENT TEMPERATURE	100 max.	°C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 90 Volts	-	-	0.1	μamp
Sensitivity:				
At 8000 Angstroms	-	0.015	-	μamp/μwatt
Luminous:				
At 0 Cycles	120	150	220	μamp/lumen
At 5000 Cycles	-	120	-	μamp/lumen
At 10000 Cycles	-	105	-	μamp/lumen
Gas Amplification Factor	-	-	7.0	

* On plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts.

← Indicates a change.

RCA

918
GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 70 volts or less:

→ For dc currents { above 5 μamp . . . 0.1 . . . megohm
below 5 μamp . . . No Minimum

With anode-supply voltage of 90 volts:

→ For dc currents { above 3 μamp . . . 2.5 . . . megohms
below 3 μamp . . . 0.1 . . . megohm

OUTLINE DIMENSIONS for Type 918
are the same as those for Type 1P37

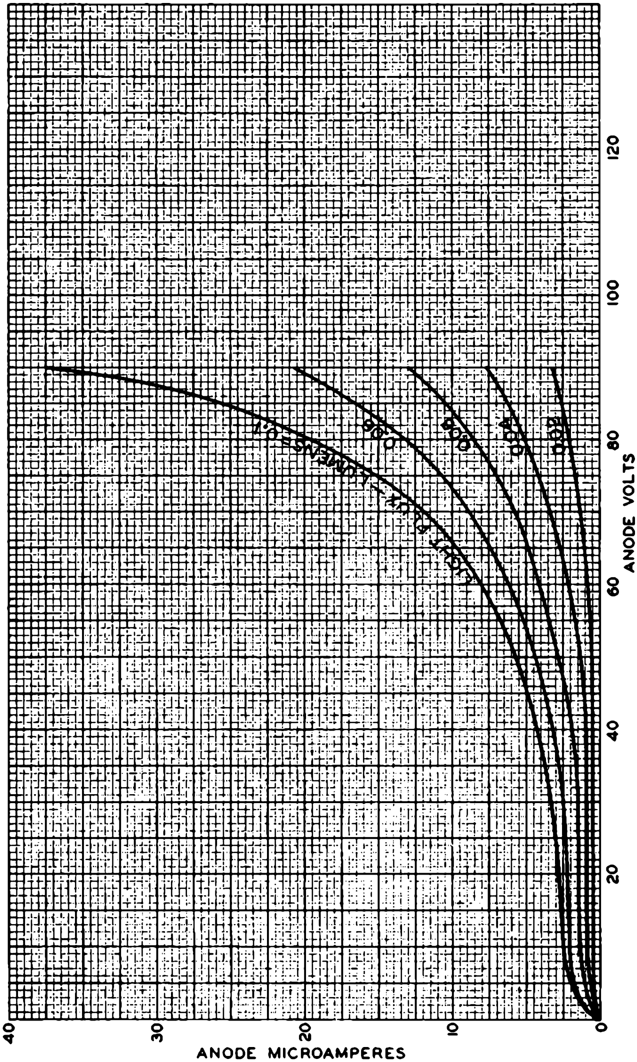
SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the beginning of this Section

→Indicates a change.

918

918

AVERAGE ANODE CHARACTERISTICS



APRIL 7, 1950

92CM-4351R2

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

919

VACUUM PHOTOTUBE

LOW-LEAKAGE TYPE WITH CATHODE-TERMINAL CAP AND S-1 RESPONSE

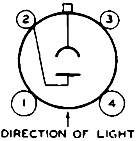
For light-measuring and relay applications

The 919 is the same as the 917 except for the following item:

General:

Base . . . . Dwarf-Shell Small 4-Pin (JETEC No.A4-26)
Basing Designation for BOTTOM VIEW 1B

Pin 1 - No Connection
Pin 2 - Anode
Pin 3 - No Connection



Pin 4 - No Connection
Cap -- Cathode

920

920
GAS PHOTOTUBE
TWIN TYPE WITH S-1 RESPONSE

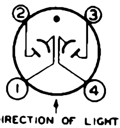
DATA

General: ←

Spectral Response S-1
Wavelength of Maximum Response. . . . . 8000 ± 1000 Angstroms
Cathodes (Each):
  Shape . . . . Quarter-Cylindrical
  Minimum Projected Length* . . . . 1-3/16"
  Minimum Projected Width*. . . . . 1/4"
Direct Interelectrode Capacitances:
  Cathode to Anode♦ . . . . 1.6 μμf
  Cathode to Cathode□ . . . . 1.8 μμf
  Anode to Anode● . . . . 0.44 μμf
Maximum Overall Length. . . . . 4"
Maximum Seated Length . . . . 3-3/8"
Seated Length to Center of Cathode. . . . . . 2-1/8" ± 3/32"
Maximum Diameter. . . . . 1-3/16"
Bulb. T-9
Mounting Position . . . . Any
Base. . . . . Small-Shell Small 4-Pin

BOTTOM VIEW

Pin 1 - Cathode, Unit No.2
Pin 2 - Anode, Unit No.2



Pin 3 - Anode, Unit No.1
Pin 4 - Cathode, Unit No.1

Maximum Ratings, ***Absolute Values*** **(Each Unit):** ←

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	90 max.	volts
PEAK CATHODE CURRENT.	6 max.	μamp
PEAK CATHODE-CURRENT DENSITY. . . .	50 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT○.	2 max.	μamp
AMBIENT TEMPERATURE	100 max.	°C

Characteristics: ←

	Min.	*Av.*	*Max.*	
Dark Current at 90 Volts. .	-	-	0.1	μamp
Sensitivity:				
At 8000 Angstroms	-	0.010	-	μamp/μwatt
Luminous:▲				
At 0 Cycles	50	100	175	μamp/lumen
At 5000 Cycles.	-	85	-	μamp/lumen
At 10000 Cycles	-	74	-	μamp/lumen
Gas Amplification Factor. .	-	-	9	

* On plane perpendicular to indicated direction of incident light.
♦ Each unit, with other unit grounded.
□ Anodes grounded.
● Cathodes grounded.
○ Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts.
▲ Measured with .04 lumen.

← Indicates a change.

RCA

920
GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 70 volts or less:

For dc currents	above 2 μamp	0.1	megohm
	below 2 μamp	No Minimum	

With anode-supply voltage of 90 volts:

For dc currents	above 1 μamp	2.5	megohms
	below 1 μamp	0.1	megohm

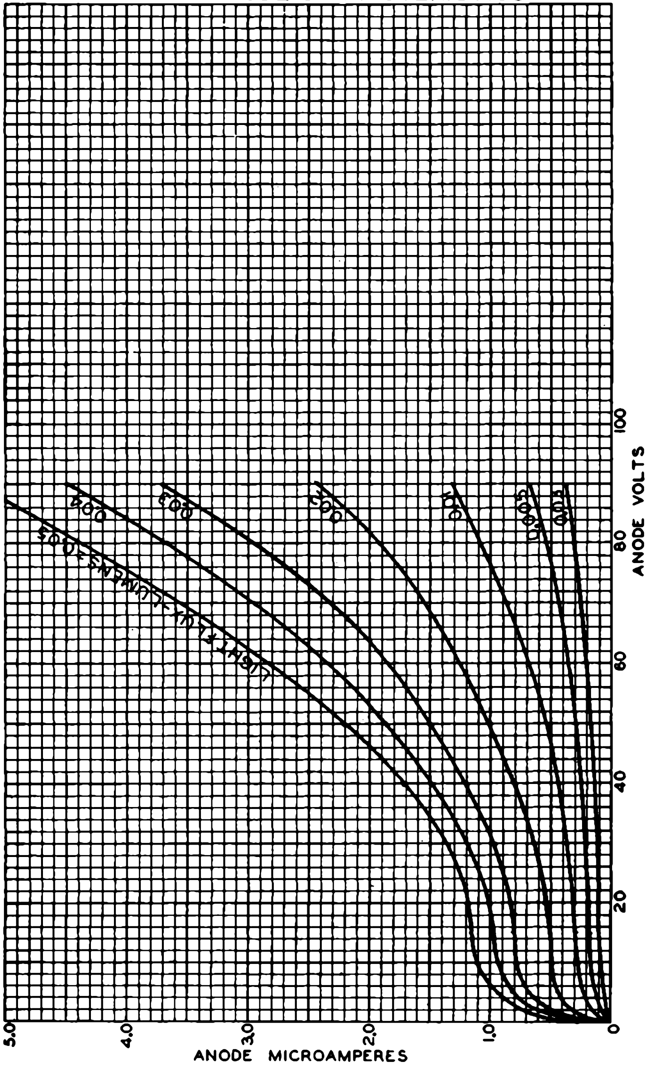
OUTLINE DIMENSIONS for Type 920
are the same as those for Type 5584

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the beginning of this Section

→ Indicates a change.

920

AVERAGE ANODE CHARACTERISTICS



921
GAS PHOTOTUBE
CARTRIDGE TYPE WITH S-1 RESPONSE

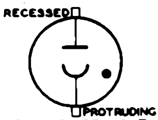
DATA

General:

Spectral Response	S-1
Wavelength of Maximum Response	8000 ± 1000 Angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	7/8"
Minimum Projected Width*	1/2"
Direct Interelectrode Capacitance	1.0 μμf
Overall Length	1-21/32" ± 1/16"
Seated Length	1-13/32" ± 1/32"
Length, Cathode Center to plane A-A' (See outline)	11/16" ± 1/16"
Maximum Diameter	0.890"
Mounting Position	Any
Terminal Caps	See Outline

BOTTOM VIEW

Recessed Terminal } Anode



Protruding Terminal } Cathode

DIRECTION OF LIGHT: INTO CONCAVE SIDE OF CATHODE

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	90 max.	volts
PEAK CATHODE CURRENT	10 max.	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	3 max.	μamp
AMBIENT TEMPERATURE	100 max.	°C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 90 Volts	-	-	0.1	μamp
Sensitivity:				
At 8000 Angstroms	-	0.0135	-	μamp/μwatt
Luminous:▲				
At 0 Cycles	75	135	205	μamp/lumen
At 5000 Cycles	-	119	-	μamp/lumen
At 10000 Cycles	-	108	-	μamp/lumen
Gas Amplification Factor	-	-	10	

* On plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts.

▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY and SENSITIVITY MEASUREMENTS", at the front of this Section.

← Indicates a change.

921

GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 70 volts or less:

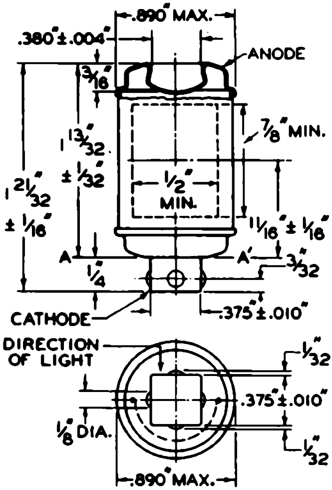
For dc currents	above 3 μamp	. . . 0.1	. . . megohm
	below 3 μamp	. . . No Minimum	

With anode-supply voltage of 90 volts:

For dc currents	above 2 μamp	. . . 2.5	. . . megohms
	below 2 μamp	. . . 0.1	. . . megohm

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the front of this Section

AVERAGE ANODE CHARACTERISTICS
of Type 921 are the same
as those shown under Type 930



CATHODE-END VIEW

92CM-4789R4

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

922

922
VACUUM PHOTOTUBE

CARTRIDGE TYPE WITH S-1 RESPONSE

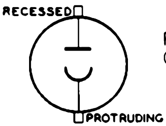
For relay applications

DATA

General:

Spectral Response	S-1
Wavelength of Maximum Response	8000 ± 1000 angstroms
Cathode:	
Shape	Semicylindrical
Minimum projected length*	5/8"
Minimum projected width*	1/2"
Direct Interelectrode Capacitance	1 μμf
Overall Length	1-21/32" + 1/32" − 1/16"
Seated Length	1-13/32" ± 1/32"
Length from Center of Useful Cathode Area to Plane A-A' *(See Dimensional Outline)*	11/16" ± 1/16"
Maximum Diameter	0.890"
Mounting Position	Any
Weight (Approx.)	0.4 oz
Terminals:	
Recessed cap	JETEC No.J1-23
Protruding cap	JETEC No.J1-24
Basing Designation	2AQ

Recessed Cap } Anode



Protruding Cap } Cathode

DIRECTION OF LIGHT: INTO CONCAVE SIDE OF CATHODE

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	500 max.	volts
AVERAGE CATHODE-CURRENT DENSITY°	30 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	5 max.	μamp
AMBIENT TEMPERATURE	100 max.	°C

Characteristics, ***At 250 Volts on Anode:***

	Min.	*Median*	*Max.*	
Sensitivity:				
Radiant, at 8000 angstroms	–	0.0018	–	μamp/μwatt
Luminous▲	10	20	40	μamp/lumen
Anode Dark Current at 25°C	–	–	0.005	μamp

* On plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum.

▲ For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A dc anode supply of 250 volts, a 1-megohm load resistor, and a light input of 0.1 lumen are used.

← Indicates a change.

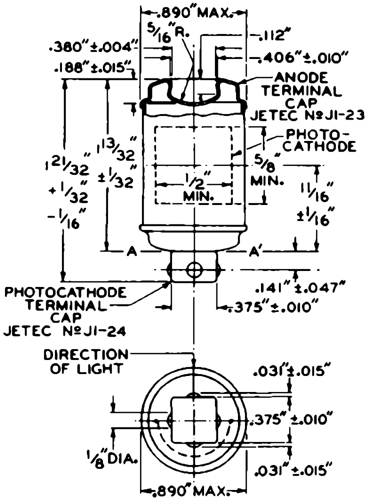
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

922
VACUUM PHOTOTUBE

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
is shown at the front of this Section

AVERAGE ANODE CHARACTERISTICS
for Type 922 are the same as those shown for Type 917



A–A' = PLANE PERPENDICULAR TO AXIS OF TUBE

92CM-4818R5

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

923
GAS PHOTOTUBE

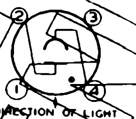
WITH S-1 RESPONSE

DATA

General:

Spectral Response	S-1
Wavelength of Maximum Response.	8000 ± 1000 Angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	13/16"
Minimum Projected Width*.	5/8"
Direct Interelectrode Capacitance	2 μμf
Maximum Overall Length.	3-9/16"
Maximum Seated Length	2-15/16"
Seated Length to Center of Cathode.	1-31/32" ± 3/32"
Maximum Diameter.	1-3/16"
Bulb.	T-9
Mounting Position	Any
Base.	Small-Shell Small 4-Pin
Basing Designation for BOTTOM VIEW.	2K

Pin 1 - No Connection
Pin 2 - Anode



Pin 3 - No Connection
Pin 4 - Cathode

Maximum Ratings, Characteristics, and Curves
for the 923
are the same as those shown
for Type 930

* On plane perpendicular to indicated direction of incident light.

← Indicates a change.

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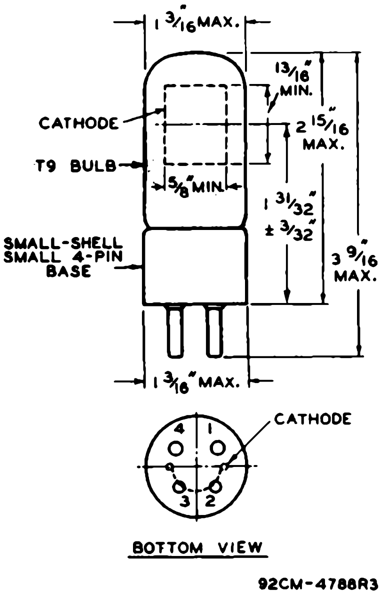
923
GAS PHOTOTUBE

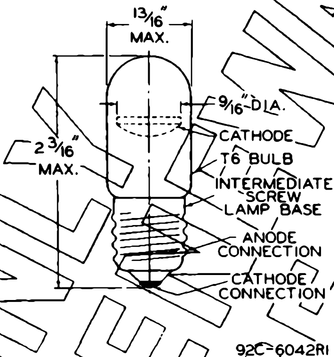


RCA

924
GAS PHOTOTUBE
END TYPE
RED—INFRARED SENSITIVE

The 924 is the same electrically as the 1P41 with the exception of its interelectrode capacitance. Mechanically, the 924 and 1P41 differ as to base, base connections, and overall length.

Direct Interelectrode Capacitance . . . . 2.6 μμf
Overall Length . . . . 2-1/16" ± 1/8"
Base . . . . Intermediate Screw



925
VACUUM PHOTOTUBE

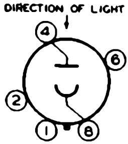
SHORT TYPE WITH S-1 RESPONSE

DATA

General:

Spectral Response	S-1
Wavelength of Maximum Response	8000 ± 1000 Angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	13/16"
Minimum Projected Width*	5/8"
Direct Interelectrode Capacitance	1.6 μμf
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-1/16"
Seated Length to Center of Cathode	1-9/32" ± 3/32"
Maximum Diameter	1-9/32"
Bulb	T-9
Mounting Position	Any
Base	Intermediate-Shell Octal 5-Pin
Basing Designation for BOTTOM VIEW	3J

Pin 1 - No Connection
Pin 2 - No Connection



Pin 4 - Anode
Pin 6 - No Connection
Pin 8 - Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	250 max.	volts
PEAK CATHODE CURRENT	15 max.	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	5 max.	μamp
AMBIENT TEMPERATURE	100 max.	°C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 250 Volts	-	-	0.0125	μamp
Sensitivity:				
At 8000 Angstroms	-	0.0015	-	μamp/μwatt
Luminous	10	20	40	μamp/lumen

* On plane perpendicular to indicated direction of incident light.
° Averaged over any interval of 30 seconds maximum.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
is shown at the beginning of this Section

← Indicates a change.

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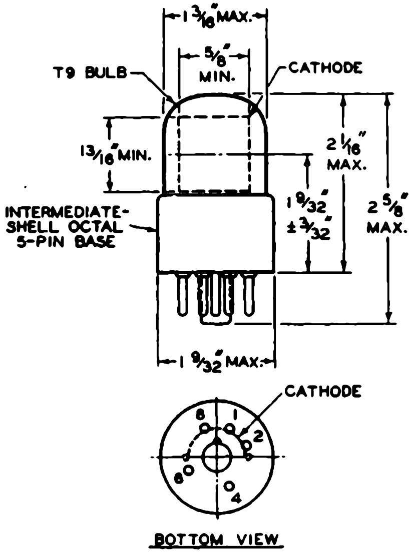
RCA

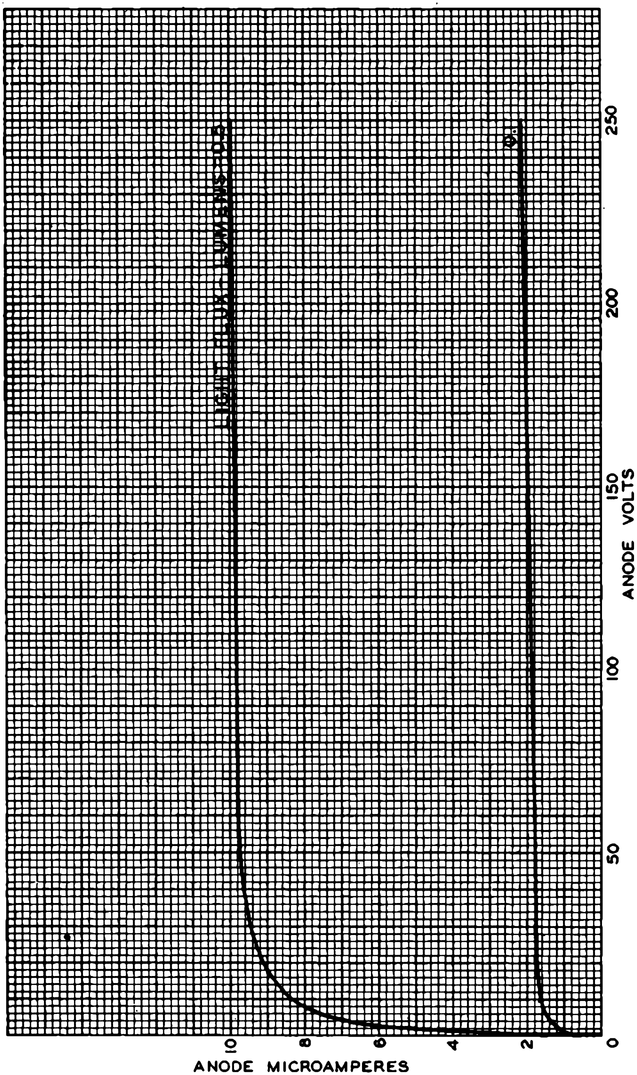
925
VACUUM PHOTOTUBE



92CM-6054R2

925

AVERAGE ANODE CHARACTERISTICS



RCA

926
VACUUM PHOTOTUBE

CARTRIDGE TYPE WITH S-3 RESPONSE

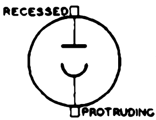
DATA

General:

Spectral Response	S-3
Wavelength of Maximum Response	4200 ± 1000 Angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	7/8"
Minimum Projected Width*	1/2"
Direct Interelectrode Capacitance	1 $\mu\mu$f
Overall Length	1-21/32" ± 1/16"
Seated Length	1-13/32" ± 1/32"
Length, Cathode Center to plane A-A' (See outline)	11/16" ± 1/16"
Maximum Diameter	0.890"
Mounting Position	Any
Terminal Caps	See Outline

BOTTOM VIEW

Recessed Terminal } Anode



Protruding Terminal } Cathode

DIRECTION OF LIGHT: INTO CONCAVE SIDE OF CATHODE

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	500 max.	volts
PEAK CATHODE CURRENT	15 max.	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	5 max.	μamp
AMBIENT TEMPERATURE	100 max.	°C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 250 Volts	-	-	0.005	μamp
Sensitivity:				
At 4200 Angstroms	-	0.0016	-	μamp/μwatt
Luminous▲	4	6.5	15	μamp/lumen ←

* On plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum.

▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY and SENSITIVITY MEASUREMENTS" at the front of this Section.

OUTLINE DIMENSIONS for Type 926
are the same as those for Type 921 ←

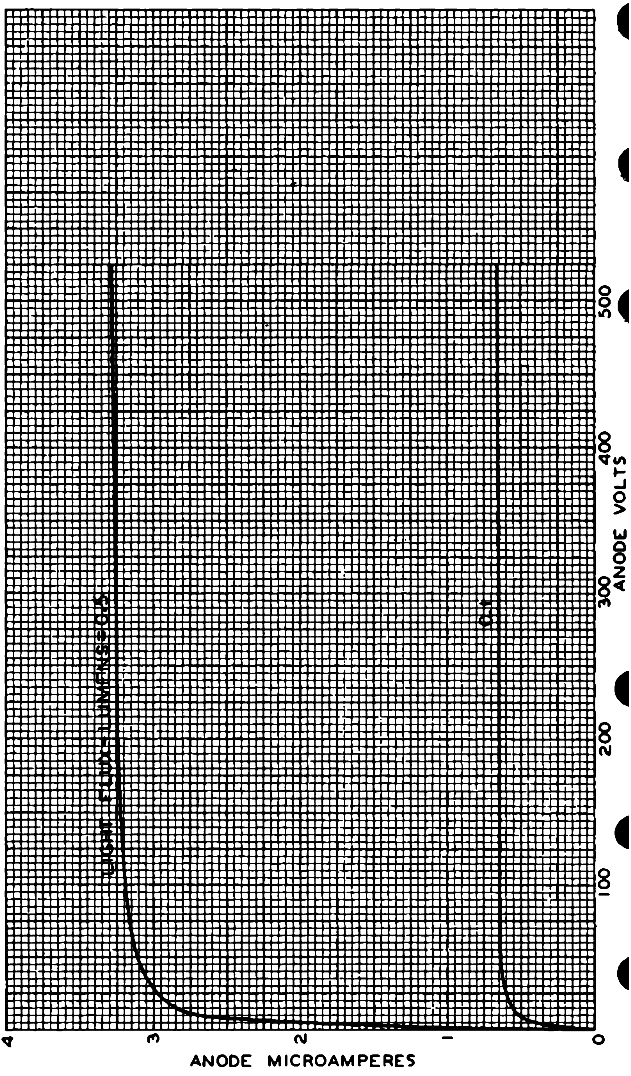
SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-3 Response
is shown at the front of this Section

← Indicates a change.

926

926

AVERAGE ANODE CHARACTERISTICS



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92CM—6209R1

927

927
GAS PHOTOTUBE

WITH S-1 RESPONSE

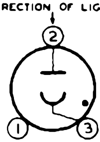
DATA

General:

Spectral Response	S-1
Wavelength of Maximum Response	8000 ± 1000 angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	11/16"
Minimum Projected Width*	7/16"
Direct Interelectrode Capacitance	2 μμf
Maximum Overall Length	2-13/32" ←
Maximum Seated Length	1-15/16" ←
Seated Length to Center of Cathode	1-1/4" ± 3/32"
Maximum Diameter	0.669" ←
Bulb	T-5-1/4 ←
Mounting Position	Any
Base	Small-Shell Peewee 3-Pin
Basing Designation for BOTTOM VIEW	2F

DIRECTION OF LIGHT

Pin 1 - No Connection



Pin 2 - Anode
Pin 3 - Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	90 max.	volts
PEAK CATHODE CURRENT	6 max.	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq.in.
AVERAGE CATHODE CURRENT°	2 max.	μamp
AMBIENT TEMPERATURE	100 max.	°C

Characteristics:

	Min.	*Av.*	*Max.*	
DC Dark Current■	-	-	0.1	μamp
Sensitivity:				
At 8000 angstroms	-	0.0125	-	μamp/μwatt
Luminous:				
At 0 cps.	75	125	185	μamp/lumen
At 5000 cps	-	110	-	μamp/lumen
At 10000 cps.	-	100	-	μamp/lumen
Gas Amplification Factor.	-	-	10	

* On plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts.

■ At 25°C and 90 volts.

← Indicates a change.

927
GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

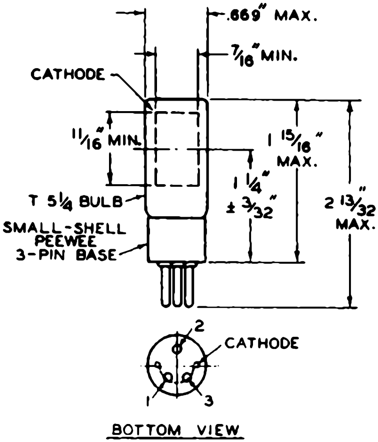
With anode-supply voltage of 70 volts or less:

For dc currents { above 2 μamp . . . 0.1 . . . megohm
below 2 μamp . . . No Minimum }

With anode-supply voltage of 90 volts:

For dc currents { above 1.0 μamp . . 2.5 . . . megohms
below 1.0 μamp . . 0.1 . . . megohm }

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the front of this Section



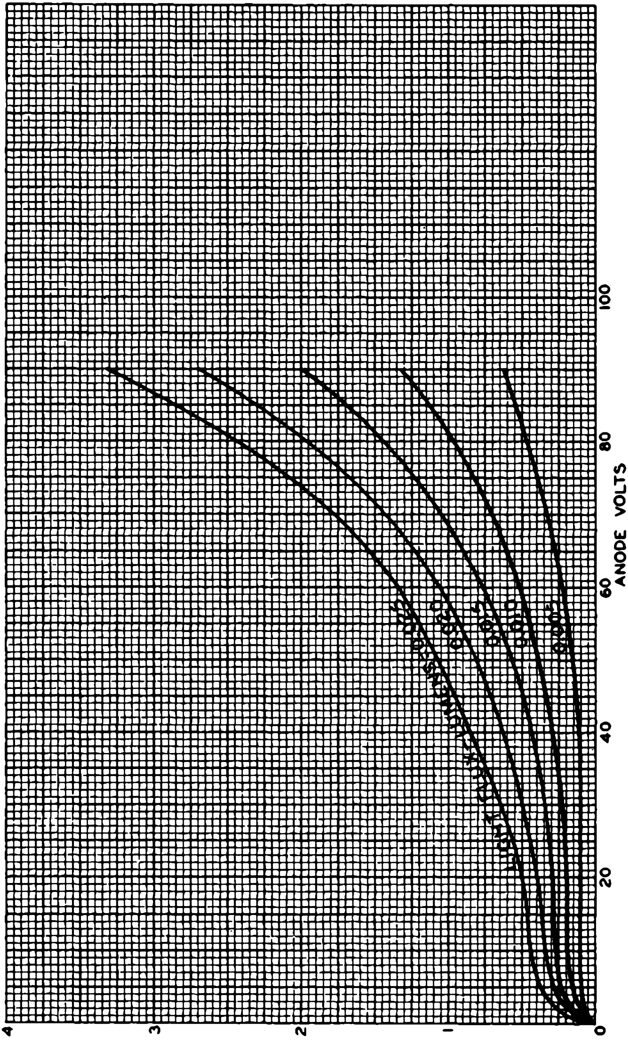
92CM-6053R4

→ Indicates a change.

RCA

927

AVERAGE ANODE CHARACTERISTICS



RCA

928
GAS PHOTOTUBE

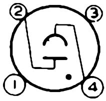
NON-DIRECTIONAL TYPE WITH S-1 RESPONSE

DATA

General:

Spectral Response	S-1
Wavelength of Maximum Response	8000 ± 1000 Angstroms
Cathode:	
Shape	Cylindrical Mesh
Minimum Length	13/16"
Minimum Diameter	5/8"
Direct Interelectrode Capacitance	3 $\mu\mu$f
Maximum Overall Length	3-9/16"
Maximum Seated Length	2-15/16"
Seated Length to Center of Cathode	1-31/32" ± 3/32"
Maximum Diameter	1-3/16"
Bulb	T-9
Mounting Position	Any
Base	Small-Shell Small 4-Pin
Basing Designation for BOTTOM VIEW	$2K_1$

Pin 1 - No Connection
Pin 2 - Anode



Pin 3 - No Connection
Pin 4 - Cathode

Maximum Ratings, *Absolute Values*:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	90 max.	volts
PEAK CATHODE CURRENT	10 max.	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	3 max.	μamp
AMBIENT TEMPERATURE	100 max.	°C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 90 Volts	-	-	0.1	μamp
Sensitivity:				
At 8000 Angstroms	-	0.0065	-	μamp/μwatt
Luminous:				
At 0 Cycles	40	65	100	μamp/lumen
At 5000 Cycles	-	56	-	μamp/lumen
At 10000 Cycles	-	50	-	μamp/lumen
Gas Amplification Factor	-	-	10	

° Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts.

← Indicates a change.

928
GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

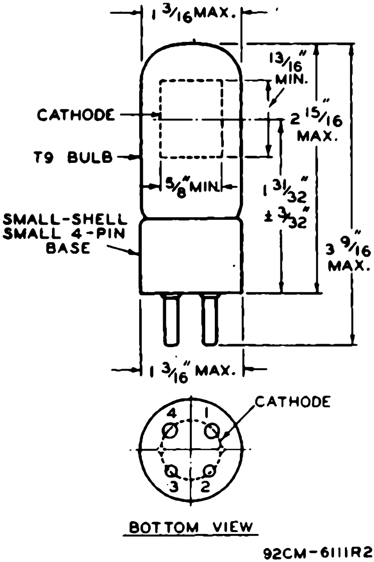
With anode-supply voltage of 70 volts or less:

→ For dc currents { above 3 µamp . . . 0.1 . . . megohm
below 3 µamp . . . No Minimum }

With anode-supply voltage of 90 volts:

→ For dc currents { above 2 µamp . . . 2.5 . . . megohms
below 2 µamp . . . 0.1 . . . megohm }

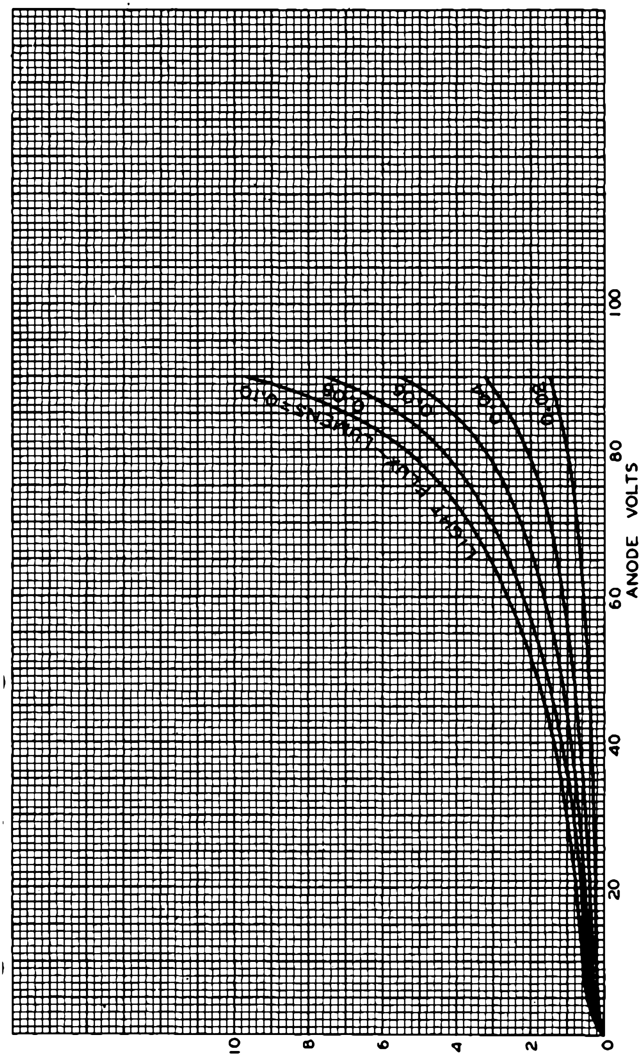
SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the beginning of this Section



→ Indicates a change.

928

AVERAGE ANODE CHARACTERISTICS



929

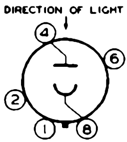
929
VACUUM PHOTOTUBE
WITH S-4 RESPONSE

DATA

General:

Spectral Response	S-4
Wavelength of Maximum Response	4000 ± 500 Angstroms ←
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	13/16"
Minimum Projected Width*	5/8"
Direct Interelectrode Capacitance	2.6 $\mu\mu$f
Maximum Overall Length	3-1/16"
Maximum Seated Length	2-1/2"
Seated Length to Center of Cathode	1-5/8" ± 3/32" ←
Maximum Diameter	1-9/32"
Bulb	T-9
Mounting Position	Any
Base	Intermediate-Shell Octal 5-Pin
Basing Designation for BOTTOM VIEW	3J

Pin 1 - No Connection
Pin 2 - No Connection



Pin 4 - Anode
Pin 6 - No Connection
Pin 8 - Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	250 max.	volts
PEAK CATHODE CURRENT	20 max.	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	5 max.	μamp
AMBIENT TEMPERATURE	75 max.	°C

Characteristics: ←

	Min.	*Av.*	*Max.*	
Dark Current at 250 Volts	-	-	0.0125	μamp
Sensitivity:				
At 4000 Angstroms	-	0.042	-	μamp/μwatt
Luminous	25	45	70	μamp/lumen

* On plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum.

OUTLINE DIMENSIONS for Type 929
are the same as those for Type 5581

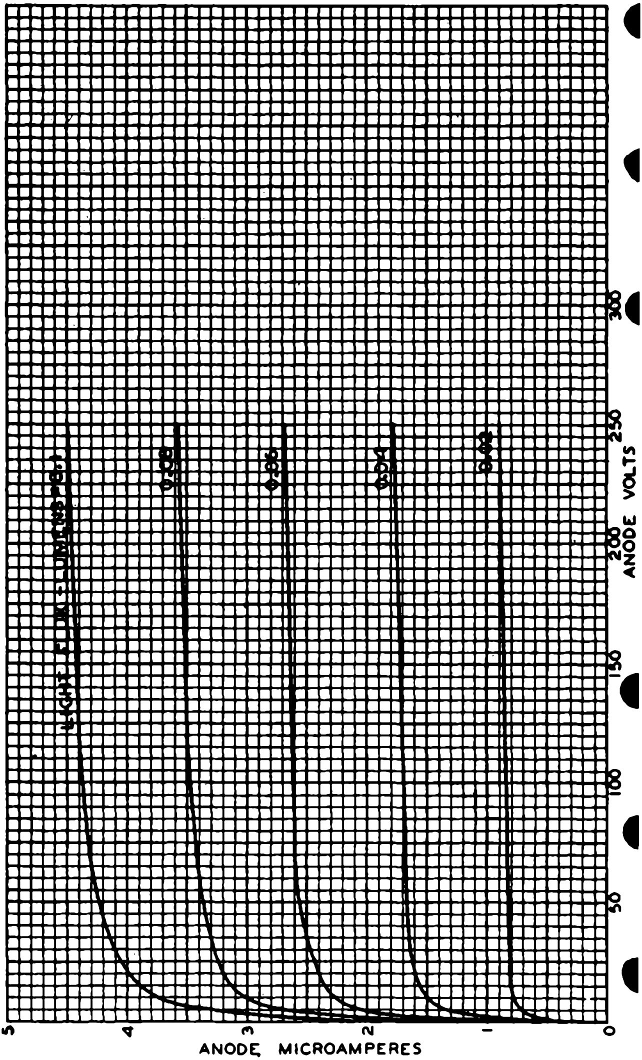
SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
is shown at the beginning of this Section

← Indicates a change.

RCA

929

AVERAGE ANODE CHARACTERISTICS



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930

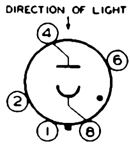
930
GAS PHOTOTUBE
WITH S-1 RESPONSE

DATA

General:

Spectral Response	S-1
Wavelength of Maximum Response	8000 ± 1000 Angstroms ←
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	13/16"
Minimum Projected Width*	5/8"
Direct Interelectrode Capacitance	2.4 μμf ←
Maximum Overall Length	3-1/16"
Maximum Seated Length	2-1/2"
Seated Length to Center of Cathode	1-5/8" ± 3/32"
Maximum Diameter	1-9/32"
Bulb	T-9
Mounting Position	Any
Base	Intermediate-Shell Octal 5-Pin
Basing Designation for BOTTOM VIEW	$3J_1$

Pin 1 - No Connection
Pin 2 - No Connection



Pin 4 - Anode
Pin 6 - No Connection
Pin 8 - Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	90 max.	volts
PEAK CATHODE CURRENT	10 max.	μamp ←
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	3 max.	μamp ←
AMBIENT TEMPERATURE	100 max.	°C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 90 Volts	-	-	0.1	μamp
Sensitivity:				
At 8000 Angstroms	-	0.0135	-	μamp/μwatt
Luminous:				
At 0 Cycles	75	135	205	μamp/lumen ←
At 5000 Cycles	-	111	-	μamp/lumen
At 10000 Cycles	-	101	-	μamp/lumen
Gas Amplification Factor	-	-	10	

* On plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 70 volts.

← Indicates a change.

930

GAS PHOTOTUBE

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 70 volts or less:

→ For dc currents	above 3 µamp . . .	0.1 . . .	megohm
	below 3 µamp . . .	No Minimum	

With anode-supply voltage of 90 volts:

For dc currents	above 2 µamp . . .	2.5 . . .	megohms
	below 2 µamp . . .	1 . . .	megohm

OUTLINE DIMENSIONS for Type 930
are the same as those for Type 5581

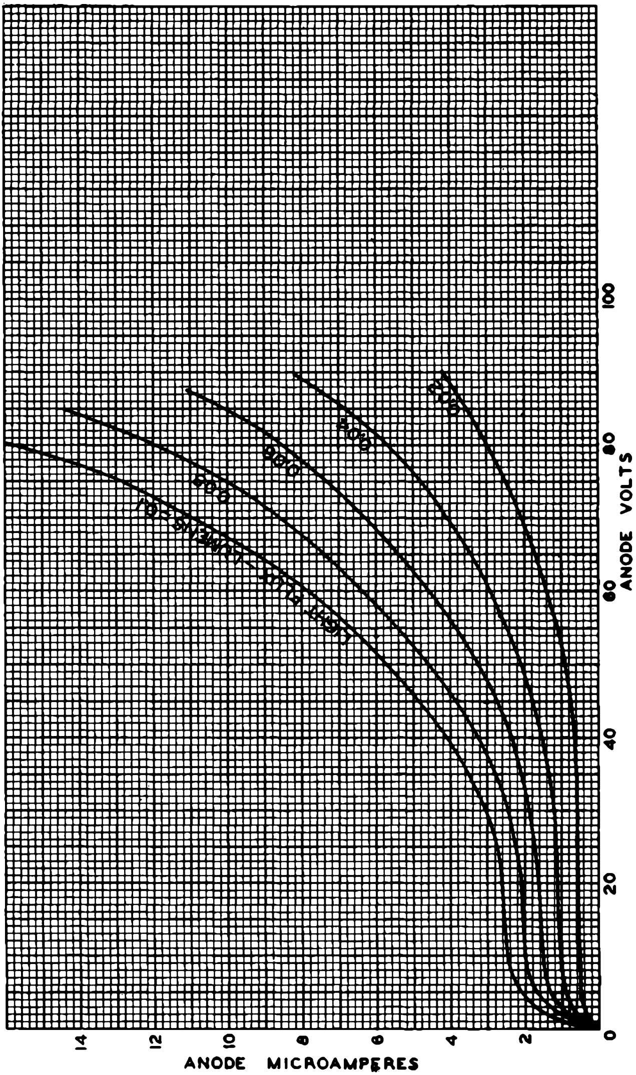
SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the beginning of this Section

→ Indicates a change.

RCA

930

AVERAGE ANODE CHARACTERISTICS



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92CM-4808R1

931-A
MULTIPLIER PHOTOTUBE

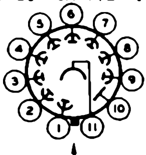
9-STAGE TYPE WITH S-4 RESPONSE

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 (Approx.):
  Anode to dynode No.9 . . . . 4.4 μμf
  Anode to all other electrodes. . . . . 6 μμf
Maximum Overall Length . . . . 3-11/16"
Maximum Seated Length. . . . . 3-1/8"
Length from Base Seat to Center
  of Useful Cathode Area . . . . 1-15/16" ± 3/32"
Maximum Diameter . . . . 1-5/16"
Mounting Position. . . . . Any
Weight (Approx.) . . . . 1.6 oz
Bulb T-9
Base . . . . .Small-Shell Submagnal 11-Pin (JETEC No.B11-88), Non-hygroscopic
  Basing Designation for BOTTOM VIEW 11K

Pin 1 - Dynode No.1
Pin 2 - Dynode No.2
Pin 3 - Dynode No.3
Pin 4 - Dynode No.4
Pin 5 - Dynode No.5
Pin 6 - Dynode No.6



DIRECTION OF LIGHT

Pin 7 - Dynode No.7
Pin 8 - Dynode No.8
Pin 9 - Dynode No.9
Pin 10 - Anode
Pin 11 - Cathode

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●	1 max.	ma
AMBIENT TEMPERATURE.	75 max.	°C

Characteristic 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 (except as noted)

	Min.	*Median*	*Max.*	
Sensitivity:				
Radiant, at 4000 angstroms	-	24000	-	μamp/μwatt

* On plane perpendicular to the indicated direction of incident light.
● Averaged over any interval of 30 seconds maximum.

← Indicates a change.

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931-A

MULTIPLIER PHOTOTUBE

	Min.	*Median*	*Max.*	
Cathode radiant, at 4000 angstroms. . .	-	0.03	-	μamp/μwatt
Luminous:♦				
At 0 cps.	4.5	24	300	amp/lumen
At 100 Mc	-	23	-	amp/lumen
Cathode luminous▲ . .	-	30	-	μamp/lumen
Current Amplification .	-	800,000	-	
Equivalent Anode-Dark-Current Input●■ . . .	-	-	2.5×10^{-9}	lumen
Equivalent Noise Input★.	-	9.5×10^{-13}	-	lumen

With E = 750 volts (except as noted)

	Min.	*Median*	*Max.*	
Sensitivity:				
Radiant, at 4000 angstroms	-	3300	-	μamp/μwatt
Cathode radiant, at 4000 angstroms. ...	-	0.03	-	μamp/μwatt
Luminous:♦				
At 0 cps.	-	3.3	-	amp/lumen
Cathode luminous▲ . .	-	30	-	μamp/lumen
Current Amplification .	-	110,000	-	

♦ 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.

▲ For conditions the same as shown under (♦) except that the value of light flux is 0.01 lumen and 100 volts are applied between cathode and all other electrodes connected together as anode.

● Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

■ For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.

★ Under the following conditions: Supply voltage (E) is 1000 volts, external shield operated at -1000 volts with respect to anode, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source at color temperature of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OPERATING CONSIDERATIONS

The *operating stability* of the 931-A is dependent on the magnitude of the anode current and its duration. When the 931-A 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 931-A usually recovers a substantial percentage of such loss in sensitivity.

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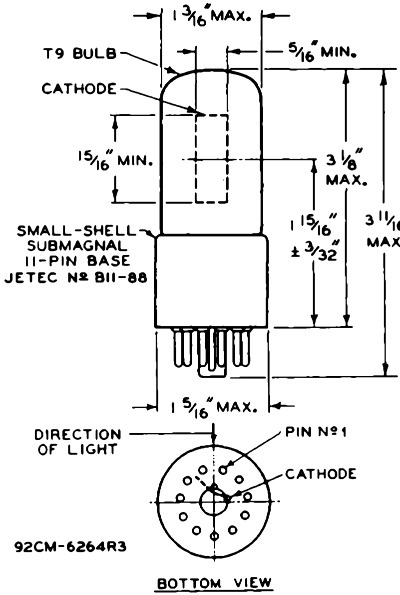
931-A

MULTIPLIER PHOTOTUBE

The use of an average anode current well below the maximum rated value of 1.0 milliampere is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 10 microamperes, and the tube should be given a warm-up period of about 1/2 hour under load conditions.

Electrostatic and/or *magnetic shielding* of the 931-A may be necessary.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
is shown at the front of this Section



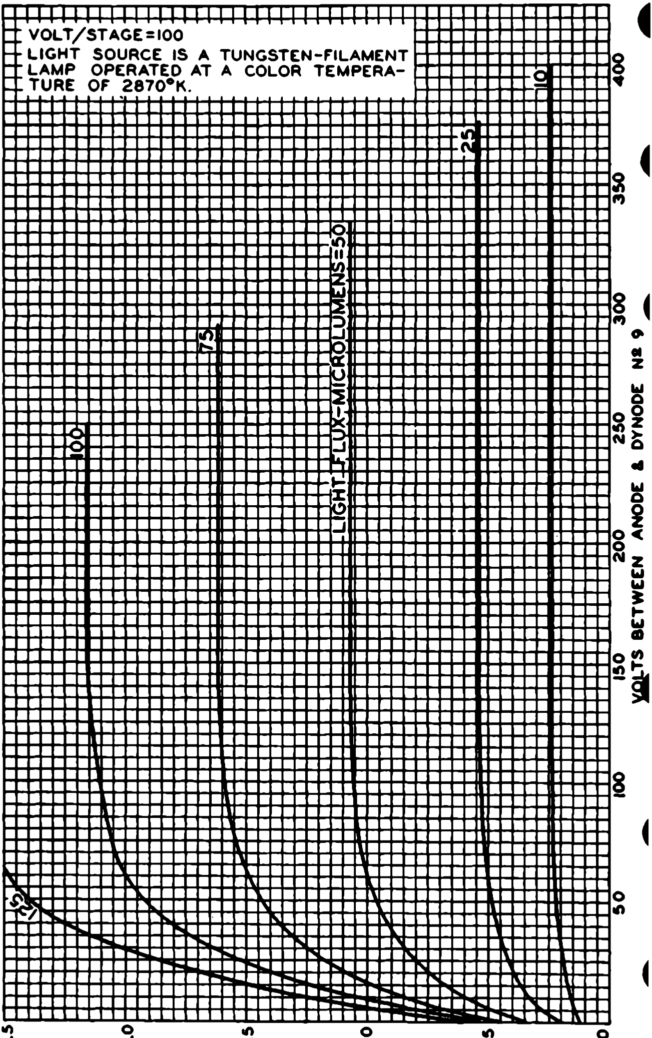
℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

931-A

931-A

AVERAGE ANODE CHARACTERISTICS



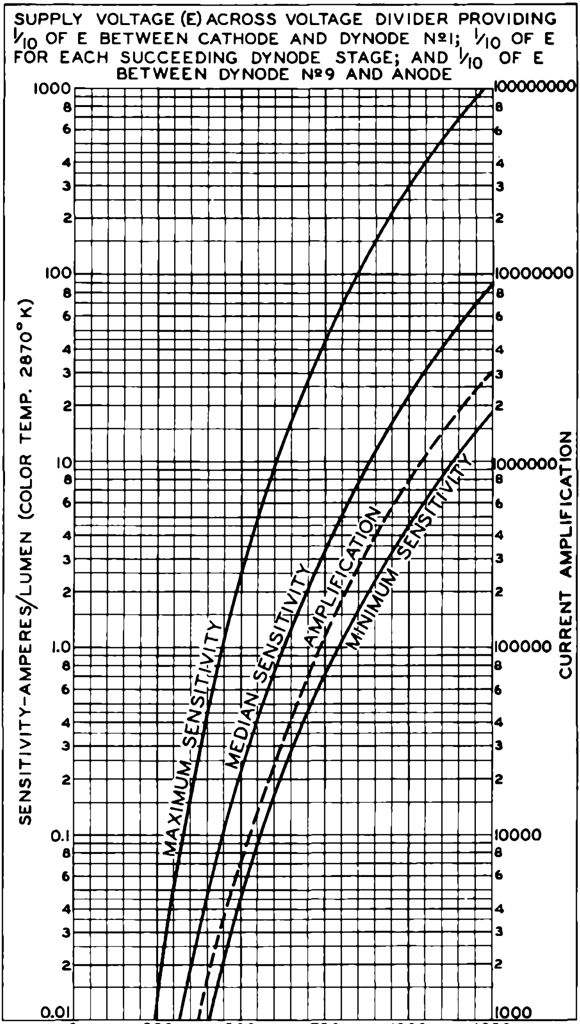
JULY 8, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6268R5

931-A

931-A
AVERAGE CHARACTERISTICS

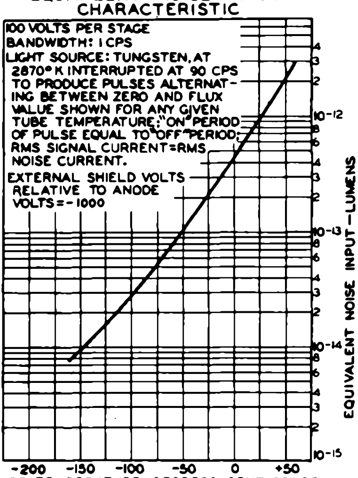


931-A

931-A

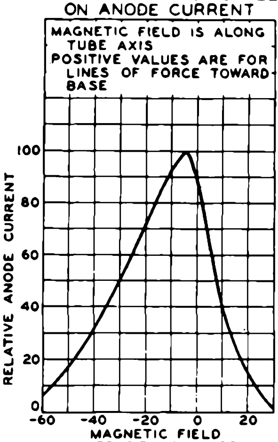
CHARACTERISTIC CURVES

EQUIVALENT-NOISE-INPUT CHARACTERISTIC



92CS-7505T1

EFFECT OF MAGNETIC FIELD ON ANODE CURRENT

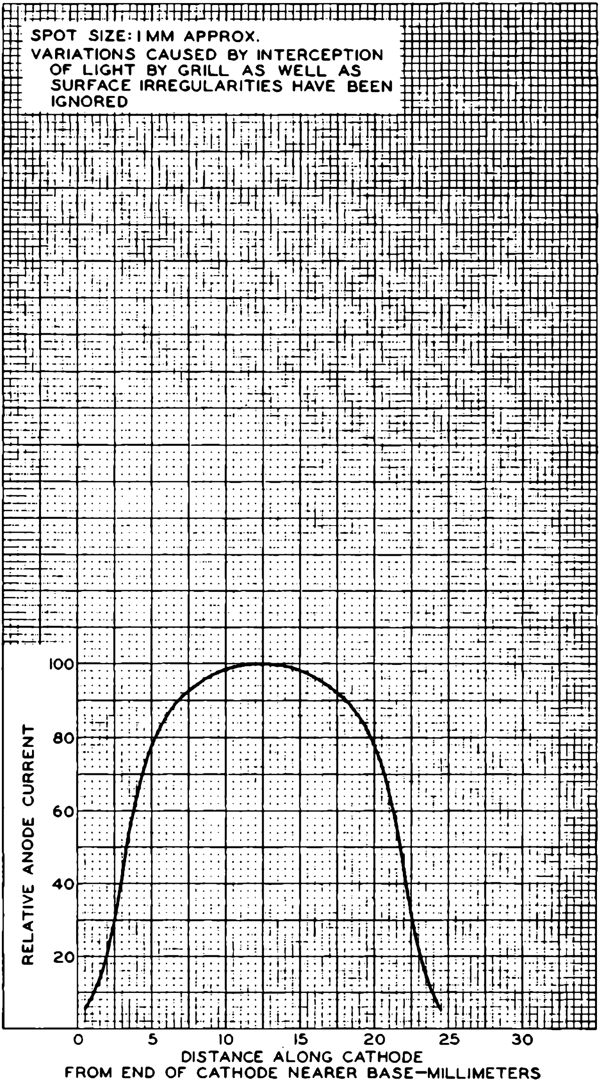


92CS-7664T1

RCA

931-A

VARIATION IN SENSITIVITY OF PHOTOCATHODE ALONG ITS LENGTH



931-A

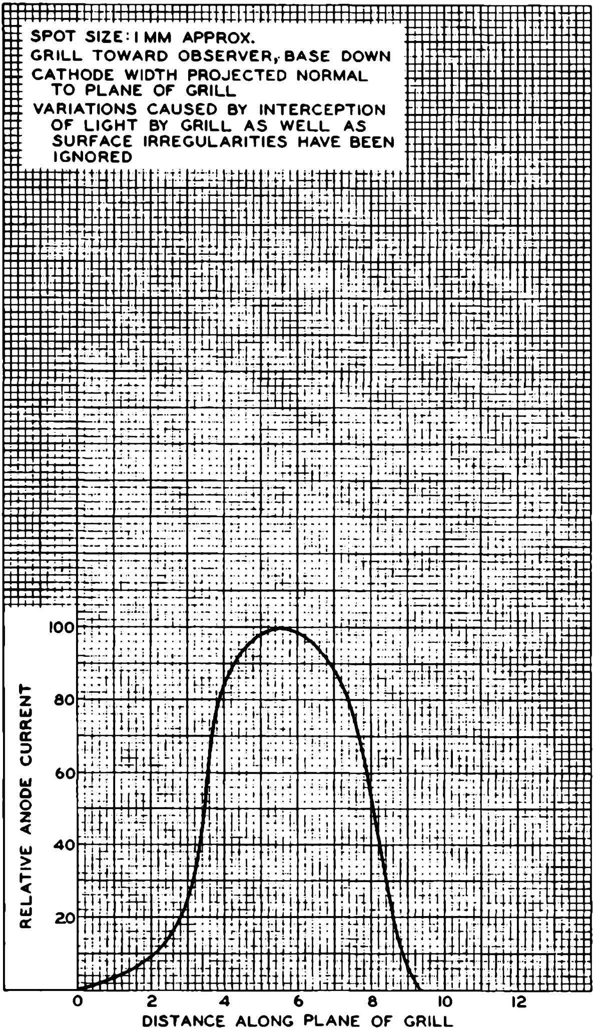
MAR. 18, 1954 TUBE DIVISION 92CM-7663R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

931-A

931-A

VARIATION IN SENSITIVITY OF PHOTOCATHODE ACROSS ITS PROJECTED WIDTH IN PLANE OF GRILL



MAR. 18, 1954

TUBE DIVISION

92CM-7667R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

934

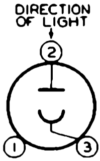
934
VACUUM PHOTOTUBE
WITH S-4 RESPONSE

DATA

General:

Spectral Response	S-4
Wavelength of Maximum Response	4000 ± 500 angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	11/16"
Minimum Projected Width*	7/16"
Direct Interelectrode Capacitance	1.5 $\mu\mu$f
Maximum Overall Length	2-13/32" ←
Maximum Seated Length	1-15/16" ←
Seated Length to Center of Cathode	1-1/4" ± 3/32"
Maximum Diameter	0.669" ←
Bulb	T-5-1/4 ←
Mounting Position	Any
Base	Small-Shell Peewee 3-Pin
Basing Designation for BOTTOM VIEW	$2F_1$

Pin 1 - No Connection



Pin 2 - Anode
Pin 3 - Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	250 max.	volts
PEAK CATHODE CURRENT	12 max.	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq.in.
AVERAGE CATHODE CURRENT●	4 max.	μamp
AMBIENT TEMPERATURE	75 max.	°C

Characteristics:

	Min.	*Av.*	*Max.*	
DC Dark Current□	-	-	0.005	μamp
Sensitivity:				
At 4000 angstroms	-	0.028	-	μamp/μwatt
Luminous	15	30	70	μamp/lumen

* On plane perpendicular to indicated direction of incident light.
● Averaged over any interval of 30 seconds maximum.
□ At 25°C and 250 volts.

OUTLINE DIMENSIONS for Type 934 are the same as those for Type 927 ←

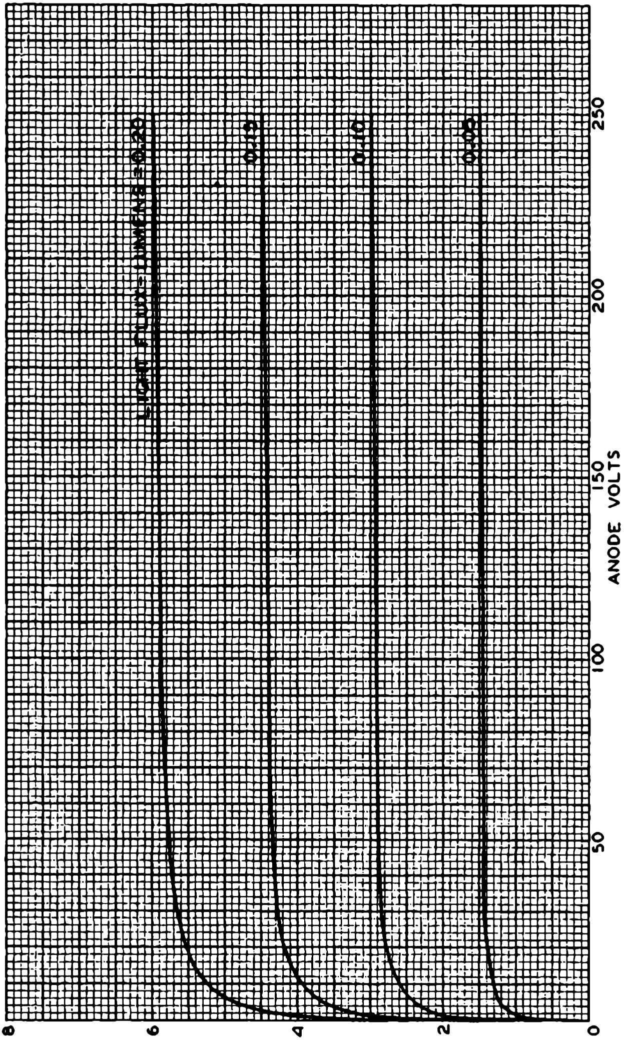
SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-4 Response is shown at the front of this Section

← Indicates a change.

934

934

AVERAGE ANODE CHARACTERISTICS



OCT. 16, 1944

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6479

RCA

935
VACUUM PHOTOTUBE

WITH S-5 RESPONSE

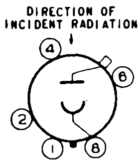
DATA

General:

Spectral Response	S-5
Wavelength of Maximum Response	3400 ± 500 Angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	1-5/16"
Minimum Projected Width*	5/8"
Direct Interelectrode Capacitance	0.6 $\mu\mu$f
Overall Length	4-1/8" ± 1/8"
Seated Length	3-9/16" ± 1/8"
Seated Length to Center of Cathode	2" ± 1/16"
Maximum Diameter	1-9/32"
Bulb	T-9
Mounting Position	Any
Cap	Skirted Miniature
Base	Intermediate-Shell Octal 5-Pin

BOTTOM VIEW

Pin 1 - No Connection
Pin 2 - No Connection
Pin 4 - No Connection



Pin 6 - No Connection
Pin 8 - Cathode
Cap - Anode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	250 max.	volts
PEAK CATHODE CURRENT	30 max.	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	10 max.	μamp
AMBIENT TEMPERATURE	75 max.	°C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 250 Volts	-	-	0.0005	μamp
Sensitivity:				
At 3400 Angstroms	-	0.032	-	μamp/μwatt ←
Luminous▲	18	35	70	μamp/lumen ←

* On plane perpendicular to indicated direction of incident radiation.

° Averaged over any interval of 30 seconds maximum.

▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY AND SENSITIVITY MEASUREMENTS" at the front of this Section.

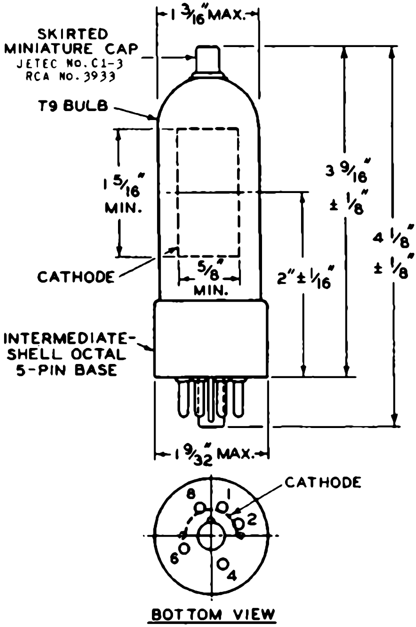
SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-5 Response
is shown at the beginning of this Section

← Indicates a change.

RCA

935

VACUUM PHOTOTUBE

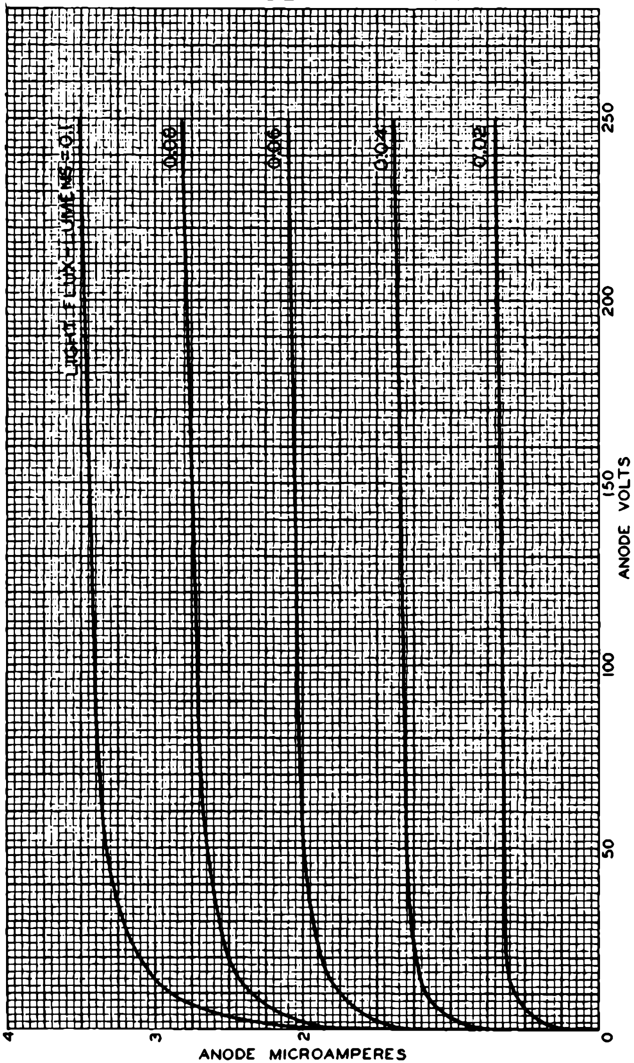


935

RCA

935

AVERAGE ANODE CHARACTERISTICS



APRIL 20, 1950 TUBE DEPARTMENT 92CM-6478R1
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

2020

2020

MULTIPLIER PHOTOTUBE

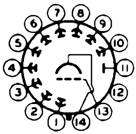
10-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE WITH
1-1/2"-DIAMETER, CIRCULAR, LOW-RESISTIVITY,
SEMITRANSPARENT PHOTOCATHODE AND S-11 RESPONSE
SHORT TIME-RESOLUTION CAPABILITY

DATA

General:

Spectral Response	S-11	
Wavelength of Maximum Response	4400 ± 500	angstroms
Cathode, Semitransparent, Low-Resistivity:		
Shape	Circular with conductive grating	
Window:		
Area including grating	1.8	sq. in.
Minimum diameter	1.5	in.
Index of refraction	1.51	
Direct Interelectrode Capacitances (Approx.):		
Anode to dynode No.10	4.4	μμf
Anode to all other electrodes	7	μμf
Maximum Overall Length	5-13/16"	
Seated Length	4-7/8" ± 3/16"	
Maximum Diameter	2-5/16"	
Operating Position	Any	
Weight (Approx.)	5 oz	
Bulb	T16	
Base	Medium-Shell Diheptal 14-Pin (JEDEC Group 5, No.B14-38), Non-hygroscopic	
Basing Designation for BOTTOM VIEW	14AA	

Pin 1 - Dynode No.1
Pin 2 - Dynode No.2
Pin 3 - Dynode No.3
Pin 4 - Dynode No.4
Pin 5 - Dynode No.5
Pin 6 - Dynode No.6
Pin 7 - Dynode No.7
Pin 8 - Dynode No.8
Pin 9 - Dynode No.9



DIRECTION OF LIGHT: INTO END OF BULB

Pin 10 - Dynode No.10
Pin 11 - Anode
Pin 12 - Internal Connection—Do Not Use
Pin 13 - Focusing Electrode
Pin 14 - Photocathode

Maximum Ratings, *Absolute Values:*

SUPPLY VOLTAGE BETWEEN ANODE AND CATHODE (DC or Peak AC)	1500 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.10 AND ANODE (DC or Peak AC)	250 max.	volts
DYNODE-No.1 SUPPLY VOLTAGE (DC or Peak AC)	400 max.	volts
FOCUSING-ELECTRODE VOLTAGE (DC or Peak AC)	400 max.	volts
AVERAGE ANODE CURRENT•	2 max.	ma
CATHODE ILLUMINATION	0.1 max.§	lumen
AMBIENT TEMPERATURE	75 max.	°C

•, §: See next page.

2020

MULTIPLIER PHOTOTUBE

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No. 1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode

With E = 1250 volts (Except as noted) and focusing electrode● connected to dynode No. 1 at socket

	Min.	*Median*	*Max.*	
Sensitivity:				
Radiant, at 4400 angstroms. . . .	-	4800	-	µa/µw
Cathode radiant, at 4400 angstroms .	-	0.04	-	µa/µw
Luminous:♠				
At 0 cps	2.5	6	75	amp/lumen
With dynode No. 10 as output electrode■ . .	-	3.6	-	amp/lumen
Cathode luminous:				
With tungsten light source▲.	30	50	-	µa/lumen
With blue light source⊕♦ . . .	0.03	-	-	µa
Current Amplification. . .	-	120000	-	
Equivalent Anode-Dark-Current Input⊕□.	-	2.5×10^{-10}	2.25×10^{-9}	lumen
Equivalent Noise Input★	-	7×10^{-12}	-	lumen

With E = 1500 volts (Except as noted) and focusing electrode● connected to dynode No. 1 at socket

	Min.	*Median*	*Max.*	
Sensitivity:				
Radiant, at 4400 angstroms. . . .	-	22400	-	µa/µw
Cathode radiant, at 4400 angstroms .	-	0.04	-	µa/µw
Luminous:♠				
At 0 cps	12	28	315	amp/lumen
With dynode No. 10 as output electrode■ . .	-	17	-	amp/lumen
Cathode luminous:				
With tungsten light source▲.	30	50	-	µa/lumen
With blue light source⊕♦ . . .	0.03	-	-	µa
Current Amplification.	-	560000	-	

●, §, •, ♠, ■, ▲, ⊕, ♦, ⊕, □, ★: See next page.

2020

MULTIPLIER PHOTOTUBE

● Averaged over any interval of 30 seconds maximum.

§ Above this value of cathode illumination, serious loss in linearity between light input and anode current will be caused by the resistivity of the cathode. For continuous light input of 0.1 lumen from tungsten light source at 2870° K incident on cathode area having diameter of 1-1/4" ± 1/8", and with dynode-No.1 voltage of 200 volts, the loss in linearity will not exceed 30 per cent depending on the magnitude of the cathode current. At 0.1 lumen, the corresponding continuous cathode current is approximately 5 microamperes, regardless of the spectral distribution of the exciting illumination.

* In general, the focusing electrode is connected to dynode No.1 at the socket and operated at the same fixed potential as dynode No.1. However, in applications critical as to magnitude, uniformity, or speed of the response, the focusing electrode may be connected to the adjustable arm of a potentiometer between cathode and dynode No.1 in the voltage divider, and operated at an optimum potential within a range of 10 to 60 per cent of the dynode-No.1 potential.

♁ 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.

■ An output current of reversed polarity to that obtained at the anode may be provided by using dynode No.10 as the output electrode. With this arrangement, the load is connected in the dynode-No.10 circuit and the anode serves only as a collector. The value of sensitivity at dynode No.10 is approximately 60 per cent of that when the anode is the output electrode. Specifically, the sensitivity measured at dynode No.10 is equal to (1 - 1/g) times the sensitivity measured at the anode, where "g" is the gain of the dynode-No.10 stage.

▲ For conditions the same as shown under (♁) except that the value of light flux is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected together as anode.

● Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870° K. The value of light flux on the filament is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 200 volts are applied between cathode and all other electrodes connected together as anode.

♦ For spectral characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870° K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870° K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.

✥ Measured at a tube temperature of 25° C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission may be reduced by the use of a refrigerant.

□ For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1250 volts is recommended.

★ Under the following conditions: Supply voltage (E) is 1250 volts, 25°-C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870° K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OPERATING CONSIDERATIONS

The *operating stability* of the 2020 depends on the magnitude and duration of the anode current. When the 2020 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 2020 usually recovers a substantial percentage of such loss in sensitivity.

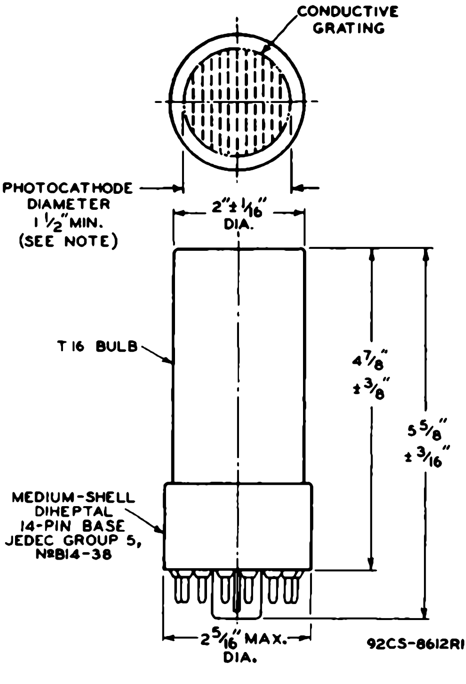
2020

MULTIPLIER PHOTOTUBE

Operation at an average anode current well below the maximum rated value of 2 milliamperes is recommended when stability is important. When maximum stability is required, the anode current should not exceed 250 microamperes.

Electrostatic and/or *magnetic shielding* of the 2020 may be necessary.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-11 Response is shown at front of this Section

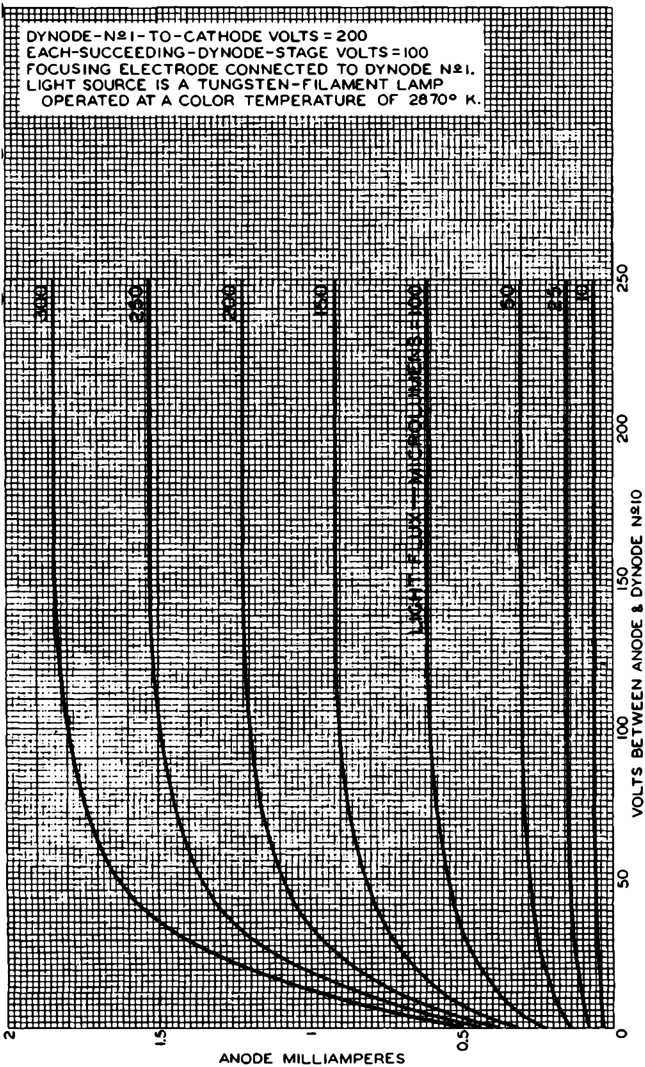


CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

NOTE: WITHIN 1-1/2" DIAMETER, DEVIATION FROM FLATNESS OF EXTERNAL SURFACE OF FACEPLATE WILL NOT EXCEED 0.010" FROM PEAK TO VALLEY.

2020

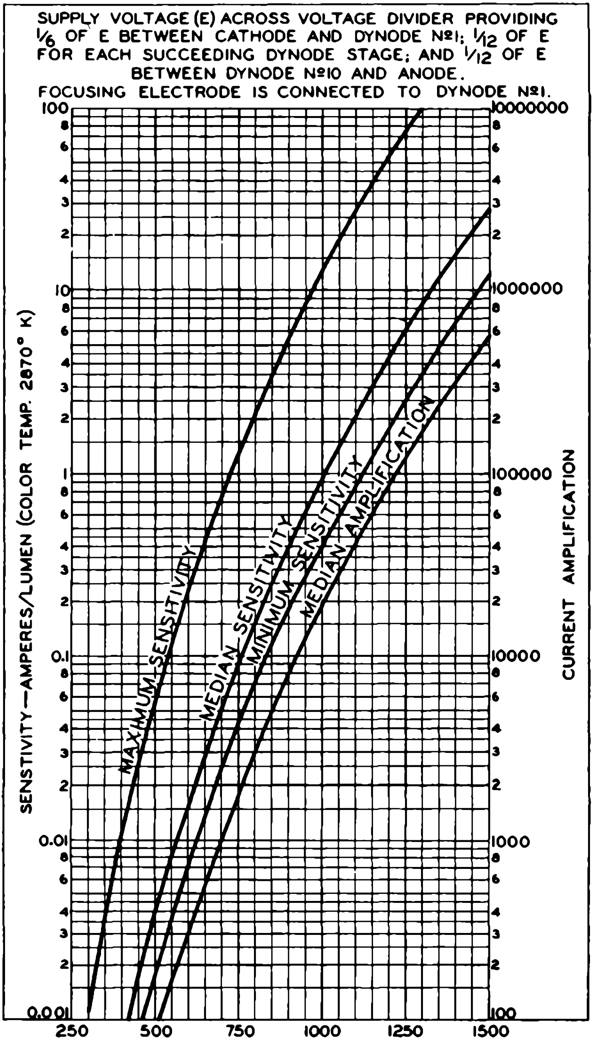
AVERAGE ANODE CHARACTERISTICS



2020

2020

CHARACTERISTICS



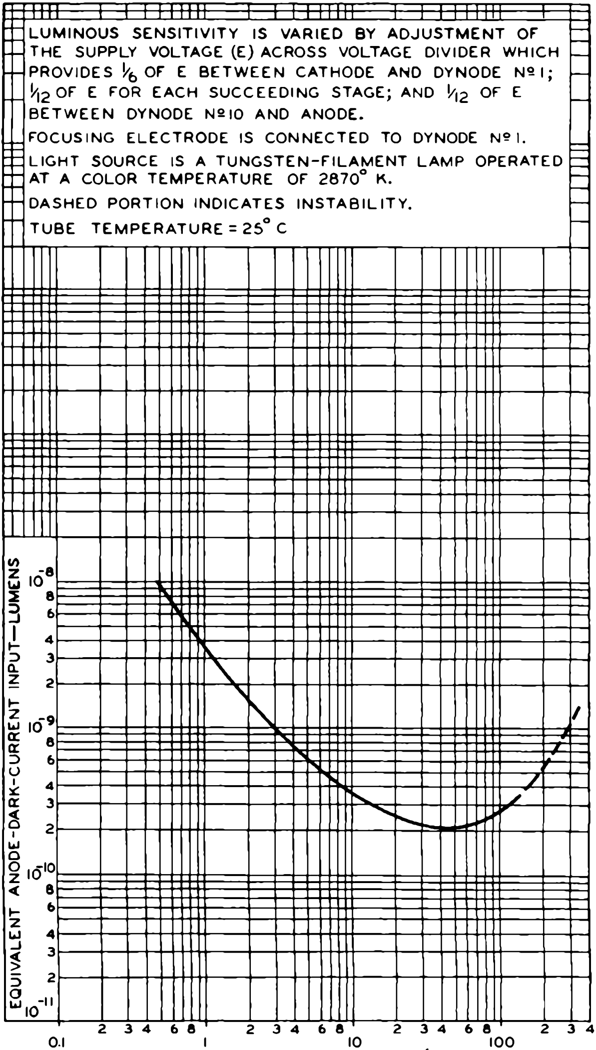
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-8637R1

RCA 2020

2020

TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



ELECTRON TUBE DIVISION

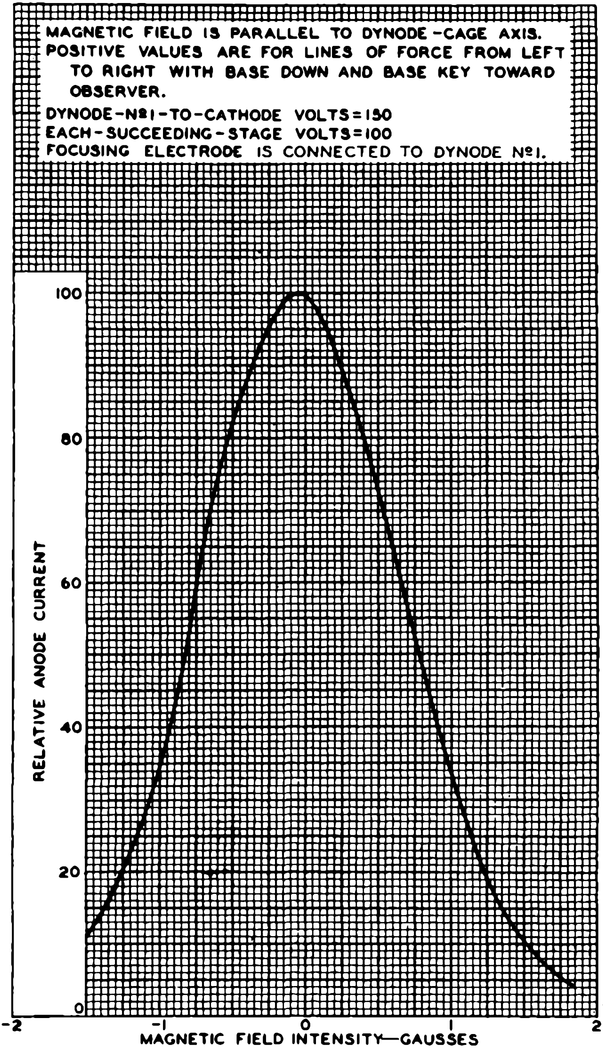
92CM-8640

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

2020

EFFECT OF MAGNETIC FIELD ON ANODE CURRENT



ELECTRON TUBE DIVISION 92CM-8136R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5581

5581
GAS PHOTOTUBE
BLUE-SENSITIVE

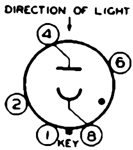
DATA

General:

Spectral Response	S-4
Wavelength of Maximum Response	4000 ± 500 Angstroms
Cathode:	
Shape	Semi-Cylindrical
Minimum Projected Length*	13/16"
Minimum Projected Width*	5/8"
Direct Interelectrode Capacitance	2.6 $\mu\mu$f
Maximum Overall Length	3-1/16"
Maximum Seated Length	2-1/2"
Seated Length to Center of Cathode	1-5/8" ± 3/32"
Maximum Diameter	1-5/16"
Bulb	T-9
Mounting Position	Any
Base	Intermediate-Shell Octal 5-Pin

BOTTOM VIEW

Pin 1 – No Connection
Pin 2 – No Connection
Pin 4 – Anode



Pin 6 – No Connection
Pin 8 – Cathode

Maximum Ratings, *Absolute Values*:

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	100 max.	volts
PEAK CATHODE CURRENT	10 max.	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	3 max.	μamp
AMBIENT TEMPERATURE	75 max.	°C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 90 Volts	–	–	0.050	μamp
Sensitivity:				
At 4000 Angstroms	–	0.125	–	μamp/μwatt
Luminous:				
At 0 Cycles	75	135	205	μamp/lumen
At 5000 Cycles	–	124	–	μamp/lumen
At 10000 Cycles	–	108	–	μamp/lumen
Gas Amplification Factor	–	–	5.5	

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 80 volts or less

For dc currents	above 3 μamp	0.1	megohm
	below 3 μamp	No Minimum	

With anode-supply voltage of 100 volts

For dc currents	above 1 μamp	2.5	megohms
	below 1 μamp	0.1	megohm

*,°: See next page.

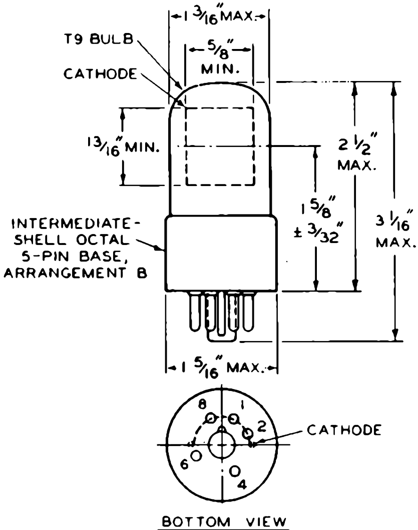
5581

5581
GAS PHOTOTUBE

* On plane perpendicular to indicated direction of incident light.

o Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.

SPECTRAL-SENSITIVITY CHARACTERISTIC
and
FREQUENCY-RESPONSE CHARACTERISTIC
of Gas Phototube having S-4 Response
are shown at beginning of this Section



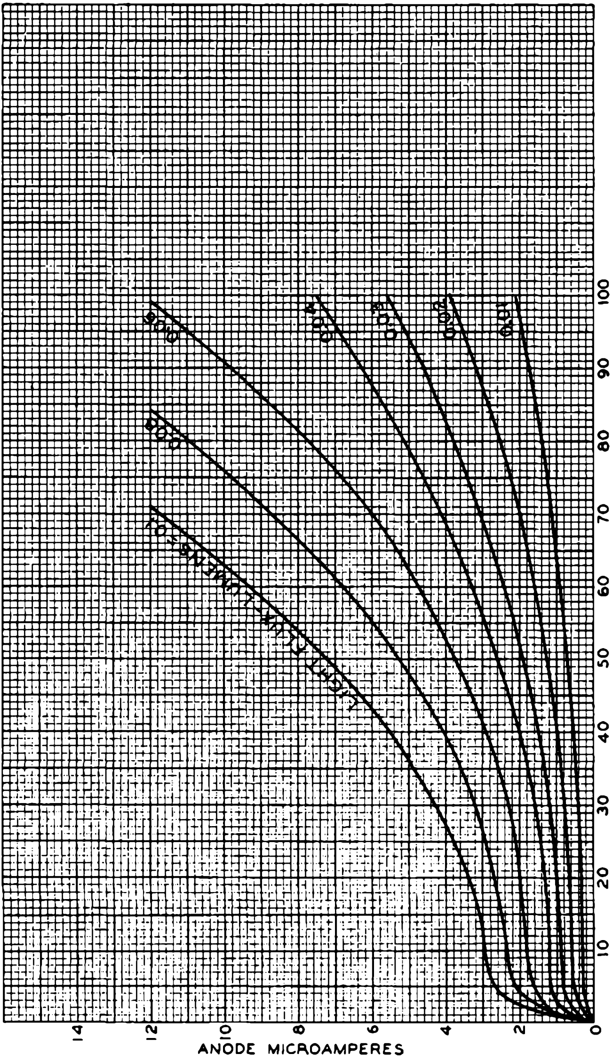
92CM-6137R2

RCA

5581

5581

AVERAGE ANODE CHARACTERISTICS



DEC. 22, 1946 — TUBE DEPARTMENT — 92CM-6822

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5582
GAS PHOTOTUBE

CARTRIDGE TYPE WITH S-4 RESPONSE

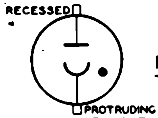
DATA

General:

Spectral Response.	S-4
Wavelength of Maximum Response	4000 ± 500 Angstroms
Cathode:	
Shape.	Semi-Cylindrical
Minimum Projected Length•.	5/8"
Minimum Projected Width•	1/2"
Direct Interelectrode Capacitance.	1.0 μμf
Overall Length	1-21/32" ± 1/16"
Length, Cathode Center to plane A-A' (See Outline)	11/16" ± 1/16"
Maximum Diameter	0.890"
Mounting Position.	Any
Terminal Caps.	See Outline

BOTTOM VIEW

Recessed Terminal } Anode



Protruding Terminal } Cathode

DIRECTION OF LIGHT: INTO CONCAVE SIDE OF CATHODE

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	100 max.	volts
PEAK CATHODE CURRENT	10 max.	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	2 max.	μamp
AMBIENT TEMPERATURE.	75 max.	°C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 90 Volts . .	-	-	0.050	μamp
Sensitivity:				
At 4000 Angstroms.	-	0.11	-	μamp/μwatt
Luminous:▲ ←				
At 0 Cycles.	80	120	175	μamp/lumen
At 5000 Cycles	-	110	-	μamp/lumen
At 10000 Cycles.	-	96	-	μamp/lumen
Gas Amplification Factor . .	-	-	5.5	

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 80 volts or less

For dc currents	above 3 μamp . . .	0.1	megohm
	below 3 μamp . . .	No Minimum	

With anode-supply voltage of 100 volts

For dc currents	above 1 μamp . . .	2.5	megohms
	below 1 μamp . . .	0.1	megohm

•,°,▲: See next page. ← indicates a change.

RCA

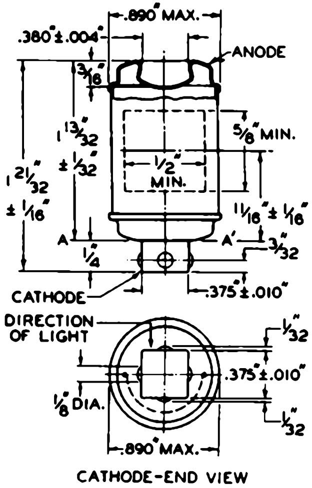
5582
GAS PHOTOTUBE

* On plane perpendicular to indicated direction of incident light.

○ Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.

▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY and SENSITIVITY MEASUREMENTS" at the front of this Section.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the front of this Section

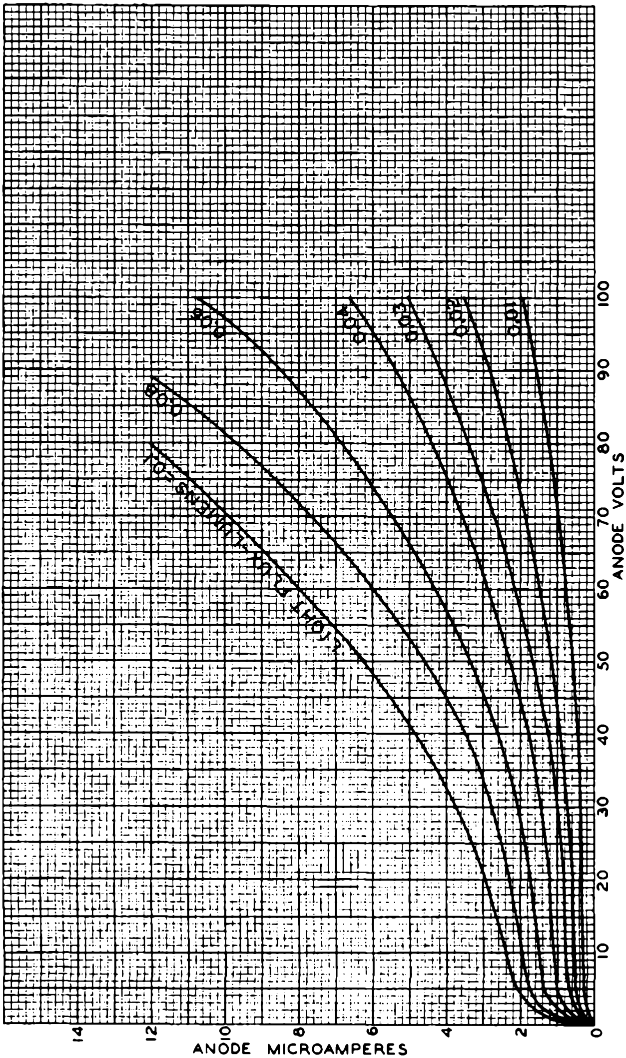


5582

RCA

5582

AVERAGE ANODE CHARACTERISTICS



5583

5583

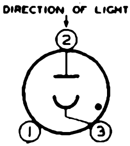
GAS PHOTOTUBE

WITH S-4 RESPONSE

DATA

General:

Spectral Response.	S-4
Wavelength of Maximum Response	4000 ± 500 angstroms
Cathode:	
Shape.	Semi-Cylindrical
Minimum Projected Length*.	11/16"
Minimum Projected Width*	7/16"
Direct Interelectrode Capacitance.	2.0 μμf
Maximum Overall Length	2-13/32" ←
Maximum Seated Length.	1-15/16" ←
Seated Length to Center of Cathode	1-1/4" ± 3/32"
Maximum Diameter	0.669" ←
Bulb	T-5-1/4 ←
Mounting Position.	Any
Base	Small-Shell Peewee 3-Pin
Basing Designation for BOTTOM VIEW	2F



Pin 1 - No Connection

Pin 2 - Anode
Pin 3 - Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	100 max.	. . volts
PEAK CATHODE CURRENT	10 max.	. . μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq.in.
AVERAGE CATHODE CURRENT°	2 max.	. . μamp
AMBIENT TEMPERATURE.	75 max.	. . . °C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 90 Volts . .	-	-	0.050	. . μamp
Sensitivity:				
At 4000 angstroms.	-	0.125	-	μamp/μwatt
Luminous:▲				
At 0 cps	75	135	205	μamp/lumen
At 5000 cps.	-	124	-	μamp/lumen
At 10000 cps	-	108	-	μamp/lumen
Gas Amplification Factor . .	-	-	5.5	

Minimum Circuit Values:

DC Load Resistance:

With anode-supply voltage of 80 volts or less

For dc currents	above 3 μamp . . .	0.1	megohm
	below 3 μamp . . .	No Minimum	

With anode-supply voltage of 100 volts

For dc currents	above 1 μamp . . .	2.5	megohms
	below 1 μamp . . .	0.1	megohm

*, °, ▲: See next page.

← Indicates a change.

5583
GAS PHOTOTUBE

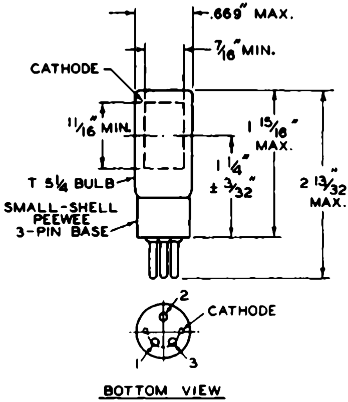
■ On plane perpendicular to indicated direction of incident light.

○ Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.

▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY AND SENSITIVITY MEASUREMENTS" at front of this Section.

SPECTRAL-SENSITIVITY CHARACTERISTIC
and
FREQUENCY-RESPONSE CHARACTERISTIC
of Gas Phototube having S-4 Response
are shown at front of this Section

AVERAGE ANODE CHARACTERISTICS
of Type 5583 are the same
as those shown under Type 5581



92CM-6053R4

→ Indicates a change.

5584

5584
GAS PHOTOTUBE

BLUE SENSITIVE, TWIN TYPE

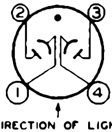
DATA

General:

Spectral Response	S-4
Wavelength of Maximum Response	4000 ± 500 Angstroms
Cathode (Each):	
Shape	Quarter-Cylindrical
Minimum Projected Length*	1-3/16"
Minimum Projected Width*	1/4"
Direct Interelectrode Capacitances:	
Cathode to Anode ♦	1.6 μμf
Cathode to Cathode ■	1.8 μμf
Anode to Anode ●	0.44 μμf
Maximum Overall Length	4"
Maximum Seated Length	3-3/8"
Seated Length to Center of Cathode	2-1/8" ± 3/32"
Maximum Diameter	1-3/16"
Bulb	T-9
Mounting Position	Any
Base	Small-Shell Small 4-Pin
Basing Designation for BOTTOM VIEW	4BG

Pin 1 - Cathode, Unit No.2

Pin 2 - Anode, Unit No.2



Pin 3 - Anode, Unit No.1

Pin 4 - Cathode, Unit No.1

Maximum Ratings, *Absolute Values* **(Each Unit):**

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	100 max.	volts
PEAK CATHODE CURRENT	10 max.	μamp
PEAK CATHODE-CURRENT DENSITY	50 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	2 max.	μamp
AMBIENT TEMPERATURE	75 max.	°C

Characteristics (Each Unit):

	Min.	*Av.*	*Max.*	
Dark Current at 90 Volts	-	-	0.050	μamp
Sensitivity:				
At 4000 Angstroms	-	0.11	-	μamp/μwatt
Luminous:				
At 0 Cycles	80	120	175	μamp/lumen
At 5000 Cycles	-	110	-	μamp/lumen
At 10000 Cycles	-	96	-	μamp/lumen
Gas Amplification Factor	-	-	5.5	

Minimum Circuit Values (Each Unit):

DC Load Resistance:

With anode-supply voltage of 80 volts or less

For dc currents { above 3 μamp . . . 0.1 . . . . megohm; below 3 μamp . . . No Minimum }

*, ♦, ■, ●, °: See next page.

5584

GAS PHOTOTUBE

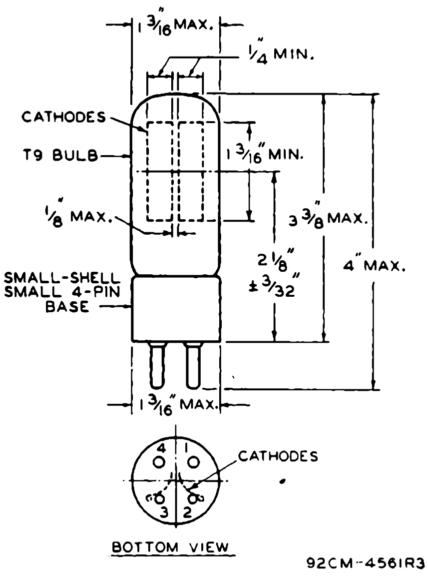
With anode-supply voltage of 100 volts

For dc currents { above 1 µamp . . . 2.5 . . . . . megohms
below 1 µamp . . . 0.1 . . . . . megohm }

* On plane perpendicular to indicated direction of incident light.
◆ Each unit, with other unit grounded.
■ Anodes grounded.
● Cathodes grounded.
° Averaged over any interval of 30 seconds maximum. Average current may be doubled when anode-supply voltage is limited to 80 volts.

SPECTRAL-SENSITIVITY CHARACTERISTIC
and
FREQUENCY-RESPONSE CHARACTERISTIC
of Gas Phototube having S-4 Response
are shown at beginning of this Section

AVERAGE ANODE CHARACTERISTICS
of Type 5584 are the same
as those shown under Type 5582



5652

5652
VACUUM PHOTOTUBE

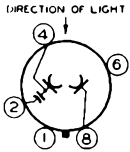
COMPOSITE ANODE-CATHODE TYPE WITH S-4 RESPONSE

DATA

General:

Spectral Response	S-4
Wavelength of Maximum Response	4000 ± 500 Angstroms
Cathode:	
Shape	Flat
Minimum Projected Length*	1/4"
Minimum Projected Width*	19/32"
Direct Interelectrode Capacitance (C_1)▲	1 $\mu\mu$f
Balancing Capacitance (C_2)□	1 $\mu\mu$f
Capacitance Difference Between C_1 and C_2	Not more than 0.3 $\mu\mu$f
Maximum Overall Length	2-7/8"
Maximum Seated Length	2-5/16"
Seated Length to Center of Cathode	1-5/8" ± 3/32"
Maximum Diameter	1-9/32"
Bulb	T-9
Mounting Position	Any
Base	Intermediate-Shell Octal 5-Pin, Non-hygroscopic
Basing Designation for BOTTOM VIEW	2AB

Pin 1: No Connection
Pin 2: Balancing Capacitance
Pin 4: Cathode or Anode



Pin 6: No Connection
Pin 8: Anode or Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	250 max.	volts
PEAK CATHODE CURRENT (For either electrode)	12 max.	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT (For either electrode)○	4 max.	μamp
AMBIENT TEMPERATURE	75 max.	°C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 250 Volts	-	-	0.01	μamp
Sensitivity:				
At 4000 Angstroms	-	0.042	-	μamp/μwatt
Luminous	30	45	70	μamp/lumen

* On plane perpendicular to indicated direction of incident light.
▲ Measured between base pins 4 and 8.
□ Measured between base pins 2 and 4.
○ Averaged over any interval of 30 seconds maximum.

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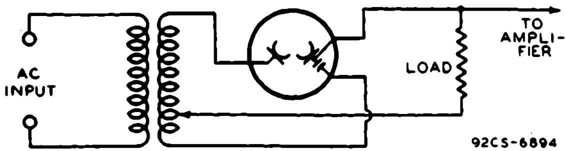
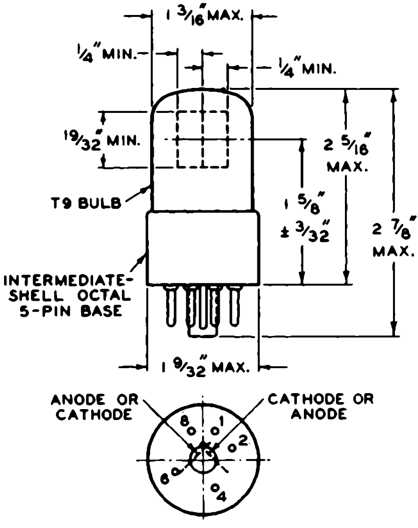
5652
VACUUM PHOTOTUBE

SPECTRAL SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
is shown at the beginning of this Section

The curve shown under Type 929
is also applicable to the 5652

TYPICAL CIRCUIT





BOTTOM VIEW

92CS-6869

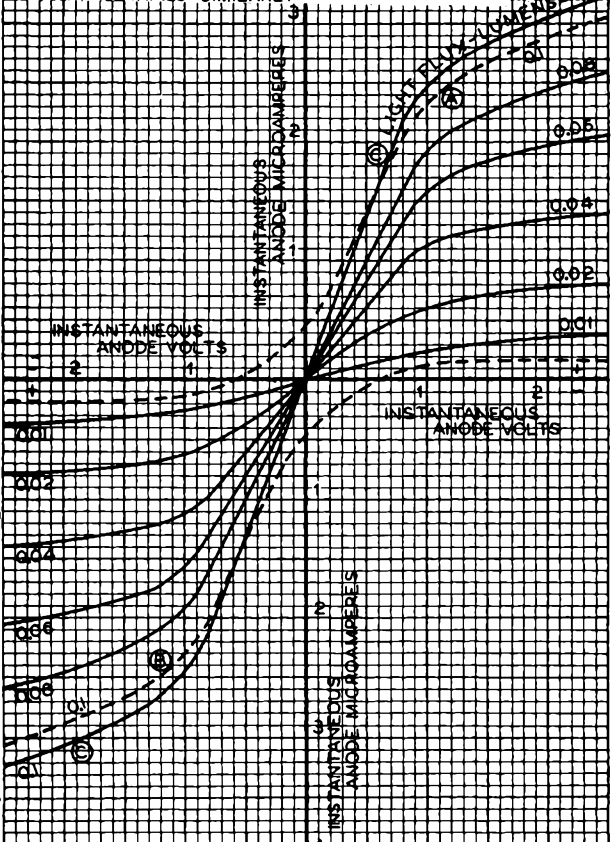
5652

5652

AVERAGE OPERATION CHARACTERISTICS

WITH AC VOLTAGE APPLIED BETWEEN THE TWO ELECTRODES

ILLUMINATION: 2870°K TUNGSTEN
LOAD RESISTANCE: ZERO
DASHED CURVE Ⓐ STATIC CHARACTERISTIC FOR ONE ELECTRODE WITH 0.1 LUMEN
DASHED CURVE Ⓑ STATIC CHARACTERISTIC FOR OTHER ELECTRODE WITH 0.1 LUMEN
CURVE Ⓒ OPERATION CURVE OBTAINED FROM STATIC CURVES A & B; OTHER OPERATION CURVES OBTAINED SIMILARLY



SEPT. 4, 1947

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92CM-6895

5653

5653

VACUUM PHOTOTUBE

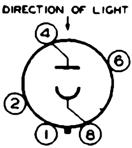
WITH S-4 RESPONSE

DATA

General:

Spectral Response	S-4
Wavelength of Maximum Response	4000 ± 500 Angstroms
Cathode:	
Shape.	Semi-Cylindrical
Minimum Projected Length*.	13/16"
Minimum Projected Width*	5/8"
Direct Interelectrode Capacitance.	2.6 μμf
Maximum Overall Length	3-1/16"
Maximum Seated Length.	2-1/2"
Seated Length to Center of Cathode	1-5/8" ± 3/32"
Maximum Diameter	1-9/32"
Bulb	T-9
Mounting Position.	Any
Base	Intermediate-Shell Octal 5-Pin
Basing Designation for BOTTOM VIEW	3J

Pin 1 - No Connection
Pin 2 - No Connection



Pin 4 - Anode
Pin 6 - No Connection
Pin 8 - Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	250 max. . . .	volts
PEAK CATHODE CURRENT	20 max. . . .	μamp
PEAK CATHODE-CURRENT DENSITY	100 max.	μamp/sq.in.
AVERAGE CATHODE CURRENT°	5 max. . . .	μamp
AMBIENT TEMPERATURE.	75 max. . . .	°C

Characteristics:

	Min.	*Av.*	*Max.*	
Dark Current at 250 Volts	-	-	0.25	. . μamp
Sensitivity:				
At 4000 Angstroms. . . .	-	0.042	-	μamp/μwatt
Luminous	20	45	100	μamp/lumen

* On plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum.

OUTLINE DIMENSIONS for Type 5653 are the same as those for Type 5581

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-4 Response is shown at beginning of this Section

AVERAGE ANODE CHARACTERISTICS of Type 5653 are the same as those shown under Type 929

RCA

5819

5819

MULTIPLIER PHOTOTUBE

10-STAGE, HEAD-ON TYPE WITH
1-1/2" SEMI-TRANSPARENT CATHODE AND S-4 RESPONSE

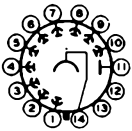
DATA

General:

Spectral Response	S-4	←
Wavelength of Maximum Response	4000 ± 500 angstroms	
Cathode, Semi-Transparent:		
Shape	Circular	
Window:		
Area	1.8 sq. in.	
Minimum diameter	1.5 in.	
Index of refraction	1.51	←
Direct Interelectrode Capacitances (Approx):		
Anode to dynode No.10	4.2 μμf	
Anode to all other electrodes	6.5 μμf	
Overall Length	5-5/8" ± 3/16"	
Seated Length	4-7/8" ± 3/16"	
Maximum Diameter	2-1/4"	
Mounting Position	Any	
Bulb	T-16	
Base	Medium-Shell Diheptal 14-Pin, Non-hygroscopic (JETEC No.B14-38)	

BOTTOM VIEW

Pin 1 - Dynode No.1
Pin 2 - Dynode No.2
Pin 3 - Dynode No.3
Pin 4 - Dynode No.4
Pin 5 - Dynode No.5
Pin 6 - Dynode No.6
Pin 7 - Dynode No.7
Pin 8 - Dynode No.8



DIRECTION OF LIGHT: INTO END OF BULB

Pin 9 - Dynode No.9
Pin 10 - Dynode No.10
Pin 11 - Anode
Pin 12 - No Connection
Pin 13 - Internal Con. Do Not Use
Pin 14 - Cathode

Maximum Ratings, *Absolute Values:*

ANODE-SUPPLY VOLTAGE (DC or Peak AC)□	1250 max.	volts	
SUPPLY VOLTAGE BETWEEN DYNODE No.10 AND ANODE (DC or Peak AC)	150 max.	volts	
SUPPLY VOLTAGE BETWEEN CATHODE AND DYNODE No.1 (DC or Peak AC)	300 max.	volts	←
ANODE CURRENT:			
Peak	7.5 max.	ma	
Average°	0.75 max.	ma	
AMBIENT TEMPERATURE	75 max.	°C	

□ Referred to cathode.

° Averaged over any interval of 30 seconds maximum.

← Indicates a change

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

5819
MULTIPLIER PHOTOTUBE

→ **Characteristics Range Values for Equipment Design:**

Under conditions with supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No.1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No.10 and anode.

	Min.	*Median*	*Max.*	
With E = 1000 volts (except as noted)				
Sensitivity:				
Radiant, at 4000 angstroms	-	23200	-	µamp/µwatt
Luminous:♠				
At 0 cps	10	25	-	amp/lumen
At 100 Mc	-	22	-	amp/lumen
Cathode radiant, at 4000 angstroms	-	0.0464	-	µamp/µwatt
Cathode luminous:				
With tungsten light source▲	40	50	-	µamp/lumen
With blue light source●♦	0.04	-	-	µamp
Current Amplification . .	-	500000	-	
Equivalent Anode-Dark-Current Input●●	-	8.5×10^{-10}	2×10^{-9}	lumen
Equivalent Noise Input♣ .	-	2×10^{-11}	-	lumen
With E = 750 volts (except as noted)				
Sensitivity:				
Radiant, at 4000 angstroms	-	2320	-	µamp/µwatt
Luminous:♠				
At 0 cps	-	2.5	-	amp/lumen
Cathode radiant at 4000 angstroms	-	0.0464	-	µamp/µwatt
Cathode luminous:				
With tungsten light source▲	40	50	-	µamp/lumen
With blue light source●♦	0.04	-	-	µamp
Current Amplification . .	-	50000	-	

♠ 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.

▲ For conditions the same as shown under (♠) except that the value of light flux is 0.01 lumen and that 150 volts are applied between cathode and all other electrodes connected together as anode.

● Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 150 volts are applied between cathode and all other electrodes connected together as anode.

♦,●,•,♣: See next page

→ Indicates a change

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5819

MULTIPLIER PHOTOTUBE

♦ For Spectral Characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.

● Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

● For maximum signal-to-noise ratio, operation below 1000 volts is recommended.

★ Under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OPERATING CONSIDERATIONS

The *operating stability* of the 5819 is dependent on the magnitude of the anode current and its duration. When the 5819 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 5819 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 0.75 milliampere is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 100 microamperes.

Electrostatic and/or magnetic shielding of the 5819 may be necessary.

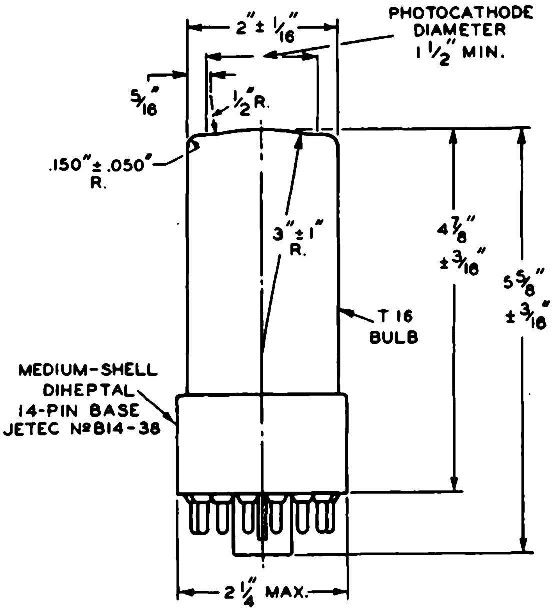
AVERAGE ANODE CHARACTERISTICS
are the same as those shown for Type 6199

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-4 Response
is shown at the front of this Section

RCA

5819

MULTIPLIER PHOTOTUBE



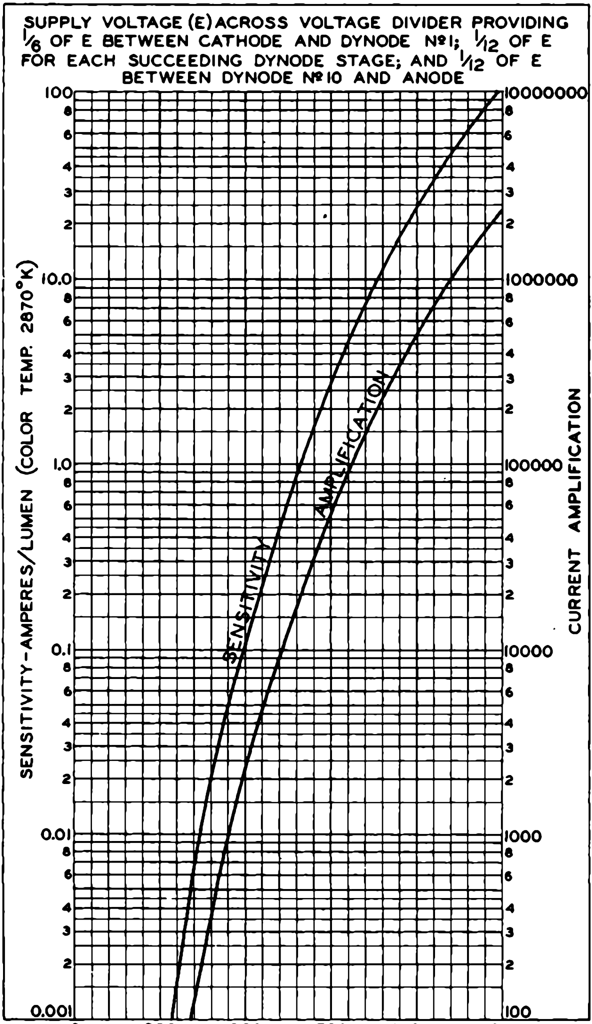
℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

92CM-7232R3

RCA

5819

AVERAGE CHARACTERISTICS



JUNE 30, 1953

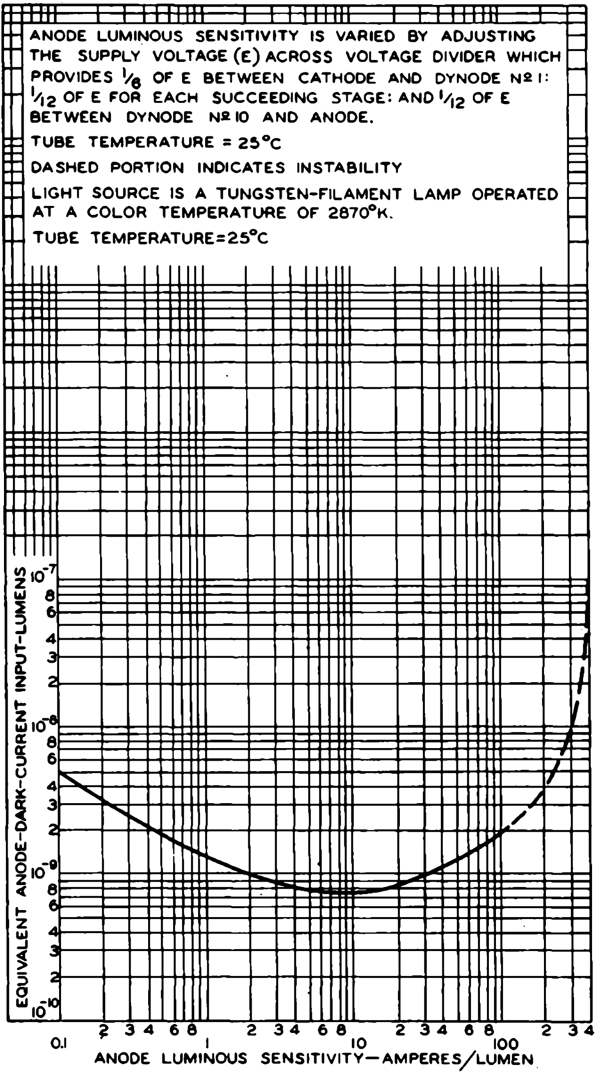
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-7258R3

5819

5819

TYPICAL ANODE DARK-CURRENT CHARACTERISTIC



FEB. 6, 1953

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7920R1

6199

MULTIPLIER PHOTOTUBE

10-STAGE, HEAD-ON TYPE WITH
1-1/4" SEMI-TRANSPARENT CATHODE AND S-4 RESPONSE

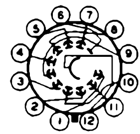
DATA

General:

Spectral Response		S-4
Wavelength of Maximum Response	4000 ± 500 angstroms	
Cathode, Semi-transparent:		
Shape		Circular
Window:		
Area	1.2	sq. in.
Minimum Diameter	1.24	in.
Minimum Diameter of Flat Surface	1	in.
Index of Refraction	1.51	
Direct Interelectrode Capacitances (Approx.):		
Anode to Dynode No.10	4	μμf
Anode to All Other Electrodes	7	μμf
Overall Length		4-3/8" ± 3/16"
Seated Length		3-7/8" ± 3/16"
Maximum Diameter		1-9/16"
Bulb		T-12
Mounting Position		Any
Base		Small-Shell Duodecal 12-Pin, Non-hygroscopic (JETEC No.B12-43)

BOTTOM VIEW

Pin 1 - Dynode No.1
Pin 2 - Dynode No.3
Pin 3 - Dynode No.5
Pin 4 - Dynode No.7
Pin 5 - Dynode No.9
Pin 6 - Anode



DIRECTION OF LIGHT: INTO END OF BULB

Pin 7 - Dynode No.10
Pin 8 - Dynode No.8
Pin 9 - Dynode No.6
Pin 10 - Dynode No.4
Pin 11 - Dynode No.2
Pin 12 - Cathode

Maximum Ratings, *Absolute Values:*

ANODE-SUPPLY VOLTAGE (DC or Peak AC)□	1250 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.10 AND ANODE (DC or Peak AC)	150 max.	volts
ANODE CURRENT:		
Peak	7.5 max.	ma
Average○	0.75 max.	ma
Average for Minimum Fatigue○	0.1 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

□ Referred to cathode.

○ Averaged over any interval of 30 seconds maximum.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6199

RCA

6199

MULTIPLIER PHOTOTUBE

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Under conditions with supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No.1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No.10 and anode

With E = 1000 volts (except as noted)

	Min.	*Av.*	*Max.*	
Sensitivity:				
Anode, at 4000 angstroms	-	22300	-	μamp/μwatt
Luminous:				
Anode:†				
At 0 cps	10	24	-	amp/lumen
At 100 Mc . . .	-	22	-	amp/lumen
Cathode:				
With Tungsten Light Source▲	20	40	-	μamp/lumen
With Blue Light Source♦♦	0.028	-	-	μamp
Current Amplification■	-	600000	-	
Equivalent Anode-Dark-Current Input*● .	-	8×10^{-10}	2.5×10^{-9}	lumen
Equivalent Noise Input★	-	4×10^{-12}	-	lumen

With E = 750 volts (except as noted)

	Min.	*Av.*	*Max.*	
Sensitivity:				
Anode, at 4000 angstroms	-	2230	-	μamp/μwatt
Luminous:				
Anode:†				
At 0 cps	-	2.4	-	amp/lumen
Cathode:				
With Tungsten Light Source▲	20	40	-	μamp/lumen
With Blue Light Source♦♦	0.028	-	-	μamp
Current Amplification■	-	60000	-	

† 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.

▲ For conditions the same as shown under (†) except that the value of light flux is 0.01 lumen and that 150 volts are applied between cathode and all other electrodes connected together as anode.

♦ Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 150 volts are applied between cathode and all other electrodes connected together as anode.

♦,■,*,●,★: See next page.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6199

MULTIPLIER PHOTOTUBE

♦ For Spectral Characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.

□ Ratio of anode sensitivity to cathode sensitivity under conditions of 2870°K tungsten light input.

* Defined as the quotient of the dc anode dark current by the anode luminous sensitivity. It is measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give an anode luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

● For maximum signal-to-noise ratio, operation below 1000 volts is recommended.

♠ Defined as the value where the rms output current is equal to the rms noise current determined under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulse.

OPERATING NOTES

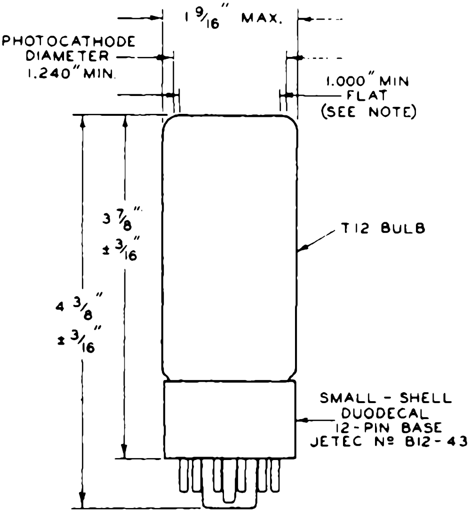
Performance of the 6199 is affected by magnetic fields. It will be observed with certain orientations of the 6199 that the earth's magnetic field is sufficient to cause a noticeable decrease in the response of the tube. Therefore, it may be desirable to provide magnetic shielding for the 6199 particularly when it is to be used in a strong magnetic field.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-4 Response is shown at the front of this Section

RCA

6199

MULTIPLIER PHOTOTUBE



NOTE: DEVIATION FROM FLATNESS WILL NOT EXCEED 0.015" FROM PEAK TO VALLEY.

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

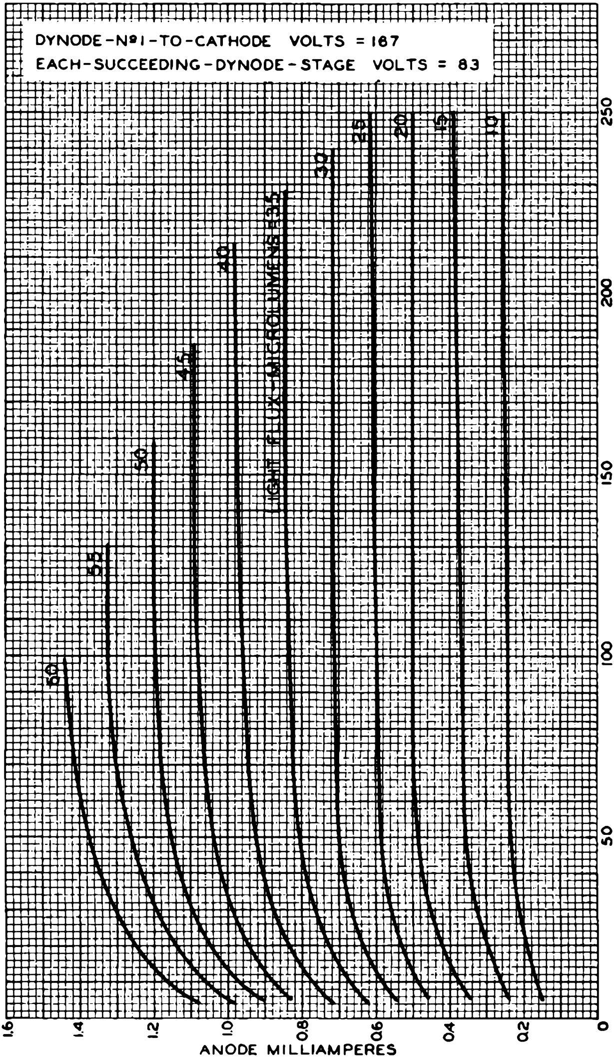
92CS-7770

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6199

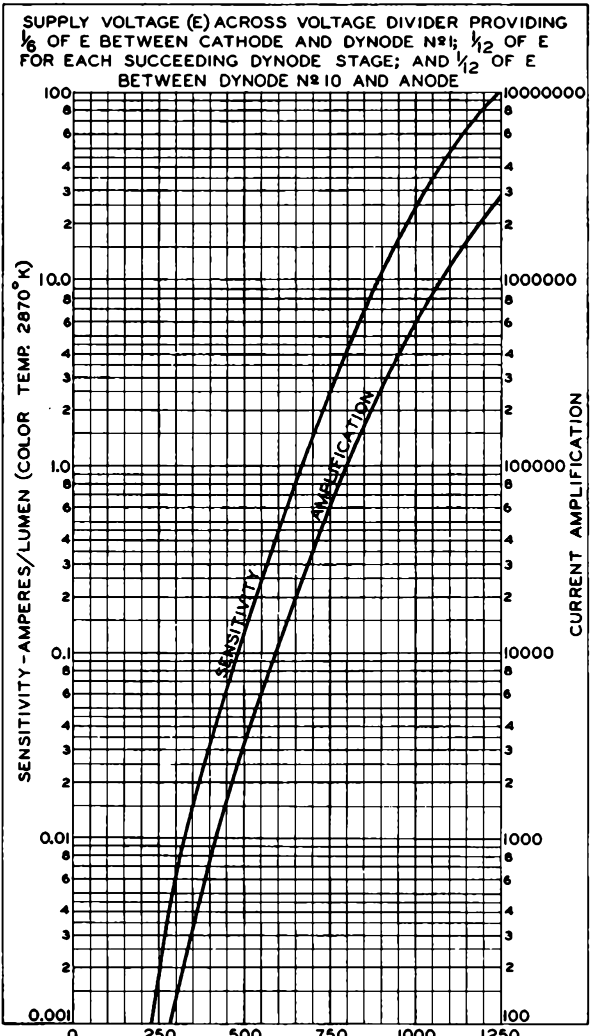
AVERAGE ANODE CHARACTERISTICS



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

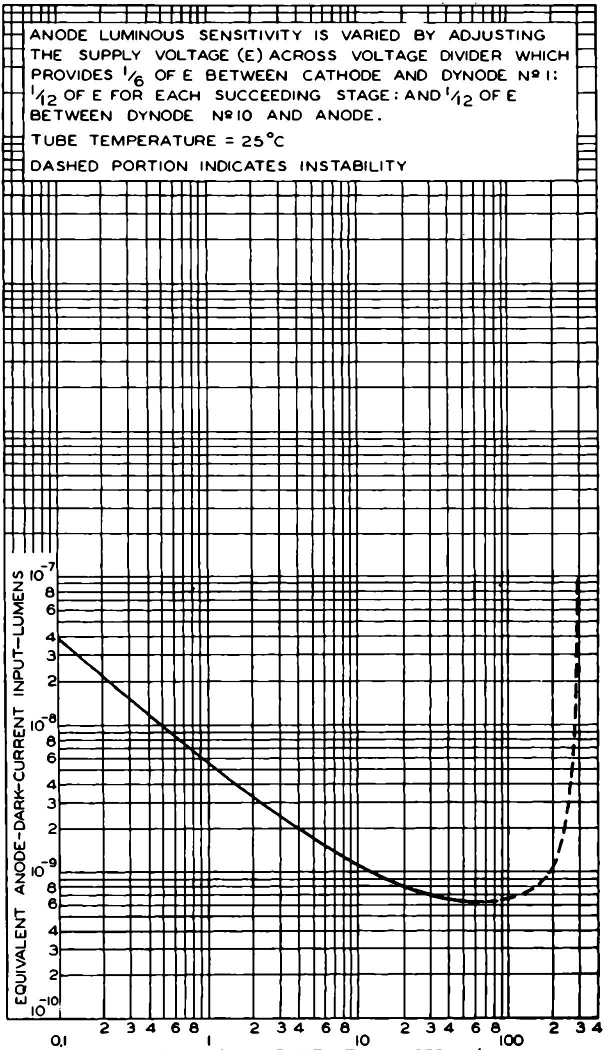
6199

AVERAGE CHARACTERISTICS



6199

TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



6217
MULTIPLIER PHOTOTUBE

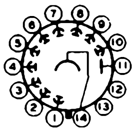
10-STAGE, HEAD-ON TYPE WITH
1-1/2" SEMI-TRANSPARENT CATHODE AND S-10 RESPONSE

DATA

General:

Spectral Response	S-10	
Wavelength Range of Highest-Response Region	3700 to 5600 angstroms	
Cathode, Semi-transparent:		
Shape	Circular	
Window:		
Area	1.8	sq. in.
Minimum Diameter	1.5	in.
Index of Refraction	1.51	
Direct Interelectrode Capacitances:		
Anode to Dynode No.10	4.2	μμf
Anode to All Other Electrodes	6.5	μμf
Overall Length	5-5/8" ± 3/16"	
Seated Length	4-7/8" ± 3/16"	
Maximum Diameter	2-1/4"	
Mounting Position	Any	
Bulb	T-16	
Base	Medium-Shell Diheptal 14-Pin, Non-hygroscopic (JETEC No.B14-38)	
Basing Designation for BOTTOM VIEW	14M1	

Pin 1 - Dynode No.1
Pin 2 - Dynode No.2
Pin 3 - Dynode No.3
Pin 4 - Dynode No.4
Pin 5 - Dynode No.5
Pin 6 - Dynode No.6
Pin 7 - Dynode No.7
Pin 8 - Dynode No.8



DIRECTION OF LIGHT: INTO END OF BULB

Pin 9 - Dynode No.9
Pin 10 - Dynode No.10
Pin 11 - Anode
Pin 12 - No Connection
Pin 13 - Internal Con. Do Not Use
Pin 14 - Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)□	1250 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.10 AND ANODE (DC or Peak AC)	150 max.	volts
ANODE CURRENT:		
Peak	7.5 max.	ma
Average○	0.75 max.	ma
Average for Minimum Fatigue○	0.1 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

□ Referred to cathode.
○ Averaged over any interval of 30 seconds maximum.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6217

6217
MULTIPLIER PHOTOTUBE

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Under conditions with supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No. 1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode

With E = 1000 volts (except as noted)

	Min.	Av.	Max.	
Sensitivity:				
Anode, at 5400 angstroms	-	8500	-	μamp/μwatt
Luminous:				
Anode:*				
At 0 cps	10	24	-	amp/lumen
At 100 Mc	-	21	-	amp/lumen
Cathode:				
With Tungsten Light Source● .	20	40	-	μamp/lumen
With Red-Infrared Light Source#♦.	0.05	-	-	μamp
Current Amplification■.	-	600000	-	
Equivalent Anode-Dark-Current Input**	-	1×10^{-8}	2.5×10^{-8}	lumen
Equivalent Noise Input##	-	4×10^{-11}	-	lumen

With E = 750 volts (except as noted)

	Min.	Av.	Max.	
Sensitivity:				
Anode, at 5400 angstroms	-	850	-	μamp/μwatt
Luminous:				
Anode:*				
At 0 cps	-	2.4	-	amp/lumen
Cathode:				
With Tungsten . . Light Source● .	20	40	-	μamp/lumen
With Red-Infrared Light Source#♦.	0.05	-	-	μamp
Current Amplification■.	-	60000	-	

* 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.

● For conditions the same as shown under (*) except that the value of light flux is 0.01 lumen and that 150 volts are applied between cathode and all other electrodes connected together as anode.

Under the following conditions: Light incident on the cathode is transmitted through a red-infrared filter (combination of Corning, Glass Code Nos. 3482 and 5850 filters) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light-flux on the filter is 0.1 lumen. The load resistor has a value of 0.01 megohm, and 150 volts are applied between cathode and all other electrodes connected together as anode. This test evaluates the magnitude of the infrared response in the tail of the response characteristic and provides a critical criterion for the response in the red band.

♦,■,**,##: See next page.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6217

MULTIPLIER PHOTOTUBE

♦ For Spectral Characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED RED-INFRARED FILTER at front of this section.

■ Ratio of anode sensitivity to cathode sensitivity under conditions of 2870°K tungsten light input.

** Defined as the quotient of the dc anode dark current by the anode luminous sensitivity. After tube has been in the dark for 30 minutes, the equivalent dark-current input is measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give an anode luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

Defined as the value where the rms output current is equal to the rms noise current determined under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OPERATING NOTES

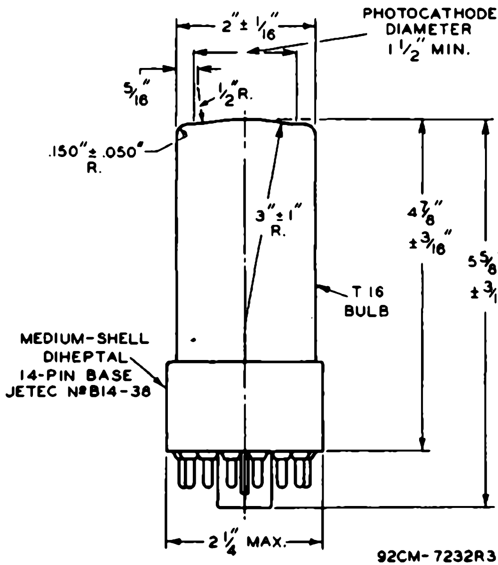
Performance of the 6217 is affected by magnetic fields. It will be observed with certain orientations of the 6217 that the earth's magnetic field is sufficient to cause a noticeable decrease in the response of the tube. Therefore, it may be desirable to provide magnetic shielding for the 6217 particularly when it is to be used in a strong magnetic field.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-10 Response
is shown at the front of this Section

AVERAGE ANODE CHARACTERISTICS,
SENSITIVITY CHARACTERISTIC,
and
CURRENT AMPLIFICATION CHARACTERISTIC
are the same as those shown for Type 6199

6217

6217
MULTIPLIER PHOTOTUBE



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

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6323

6323

MULTIPLIER PHOTOTUBE

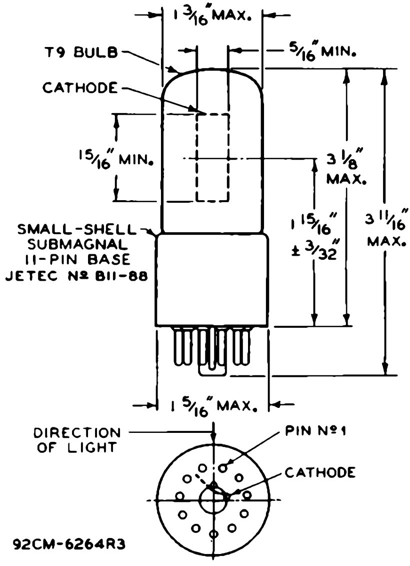
9-STAGE TYPE WITH S-4 RESPONSE

For Headlight-Control Service

The 6323 is the same as the 6328 except for the following items:

General:

Direct Interelectrode Capacitances (Approx.):	
Anode to dynode No.9.	4.4 μμf
Anode to all other electrodes	6 μμf
Maximum Overall Length.	3-11/16"
Maximum Seated Length	3-1/8"
Length from Base Seat to Center of Useful Cathode Area.	1-15/16" ± 3/32"
Weight (Approx.).	1.6 oz
Base.	Small-Shell Submagnal 11-Pin (JETEC No.B11-88), Non-hygroscopic



BOTTOM VIEW

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

NOTE: THE MAXIMUM ANGULAR VARIATION BETWEEN THE PLANE THROUGH PINS No. 1 AND No. 11 AND THE PLANE OF THE GRILL WILL NOT EXCEED 6°.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6328

6328

MULTIPLIER PHOTOTUBE

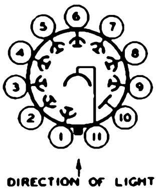
9-STAGE TYPE WITH S-4 RESPONSE
FOR HEADLIGHT-CONTROL SERVICE

DATA

General:

Spectral Response		S-4
Wavelength of Maximum Response		4000 ± 500 angstroms
Cathode:		
Minimum Projected Length*		15/16"
Minimum Projected Width*		5/16"
Direct Interelectrode Capacitances:		
Anode to Dynode No.9	4.2	μμf
Anode to All Other Electrodes	5.5	μμf
Maximum Overall Length		3-1/8"
Maximum Seated Length		2-11/16"
Length from Base Seat to Center of Useful Cathode Area		1-9/16" ± 3/32"
Maximum Diameter		1-5/16"
Bulb		T-9
Mounting Position		Any
Base		Small-Shell Neosubmagnal 11-Pin, Non-hygroscopic (JETEC No.B11-104)
Basing Designation for BOTTOM VIEW		11K

Pin 1: Dynode No.1
Pin 2: Dynode No.2
Pin 3: Dynode No.3
Pin 4: Dynode No.4
Pin 5: Dynode No.5
Pin 6: Dynode No.6



DIRECTION OF LIGHT

Pin 7: Dynode No.7
Pin 8: Dynode No.8
Pin 9: Dynode No.9
Pin 10: Anode
Pin 11: Cathode

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.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6328

RCA

6328

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.	*Av.*	*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	-	-	0.1	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.

OPERATING CONSIDERATIONS

The *operating stability* of the 6328 is dependent on the magnitude of the anode current and its duration. When the 6328 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 6328 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 6328 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.

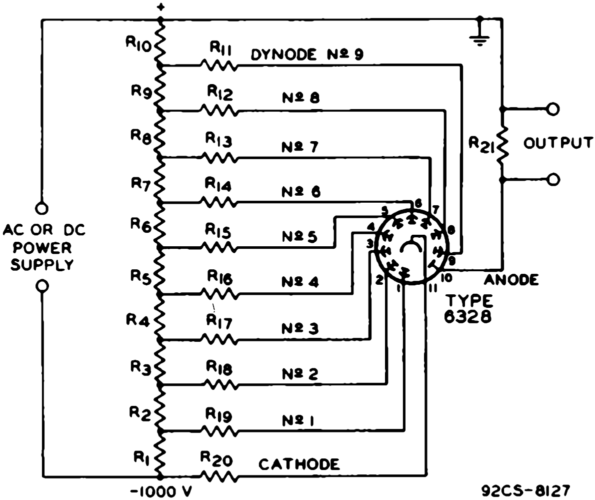
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6328

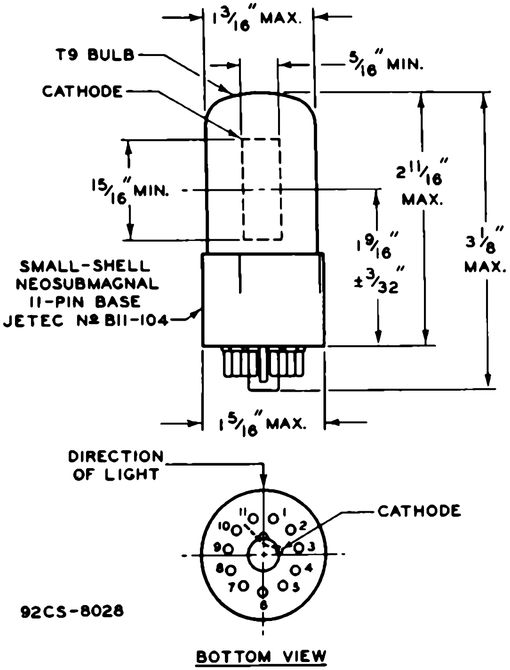
MULTIPLIER PHOTOTUBE

RECOMMENDED VOLTAGE-DIVIDER NETWORK FOR USE WITH TYPE 6328 IN HEADLIGHT DIMMING SERVICE



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

6328
MULTIPLIER PHOTOTUBE

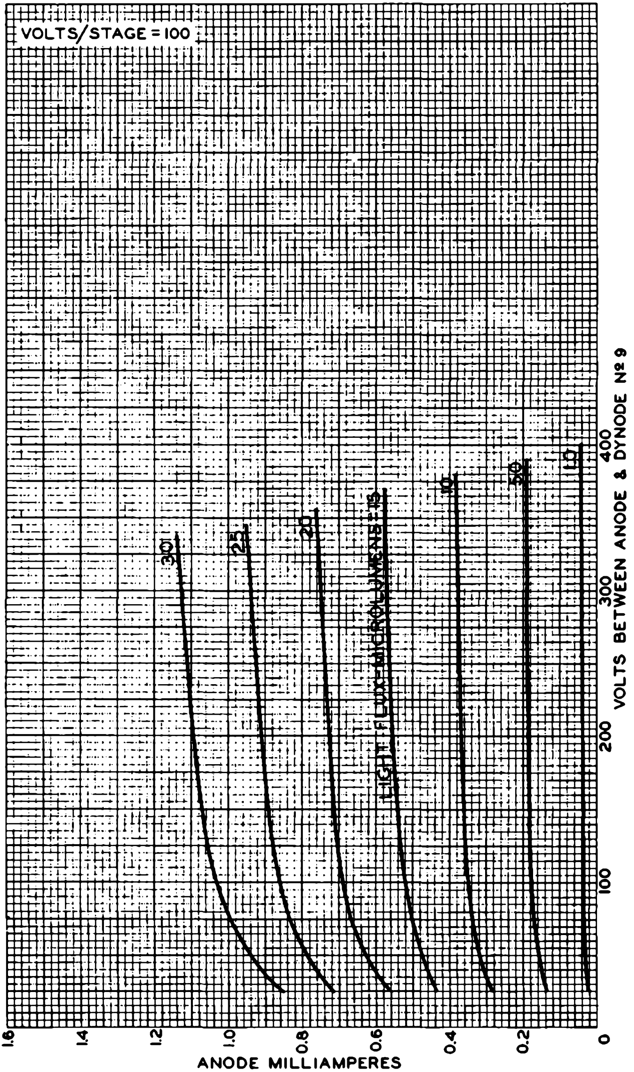


℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

NOTE: THE MAXIMUM ANGULAR VARIATION BETWEEN THE PLANE THROUGH PINS No. 1 AND No. 11 AND THE PLANE OF THE GRILL WILL NOT EXCEED 6°.

6328

AVERAGE ANODE CHARACTERISTICS



JULY 1, 1953

TUBE DEPARTMENT
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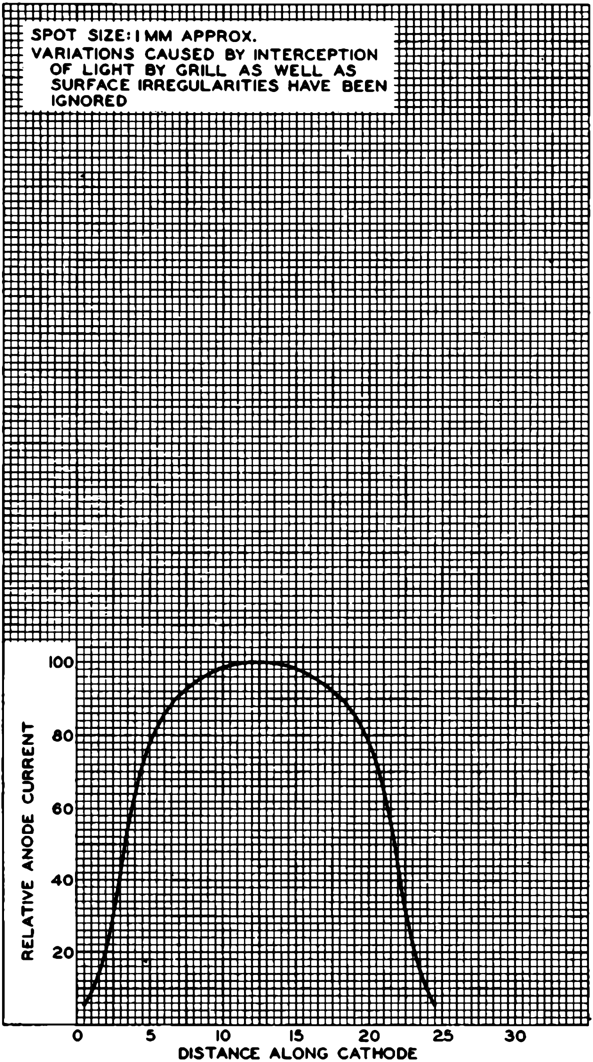
92CM-8029

6328

6328

VARIATION IN SENSITIVITY OF PHOTOCATHODE ALONG ITS LENGTH



MAR. 18, 1954

TUBE DEPARTMENT

92CM-7663R1

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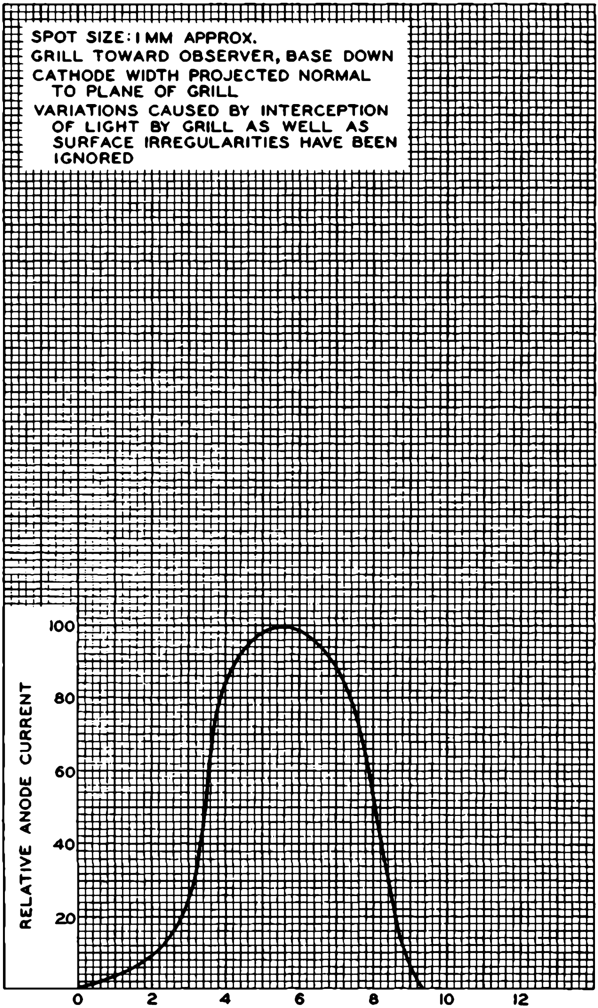
6328

6328

VARIATION IN SENSITIVITY OF PHOTOCATHODE ACROSS ITS PROJECTED WIDTH IN PLANE OF GRILL



MAR. 18, 1954 TUBE DEPARTMENT 92CM-7667R1

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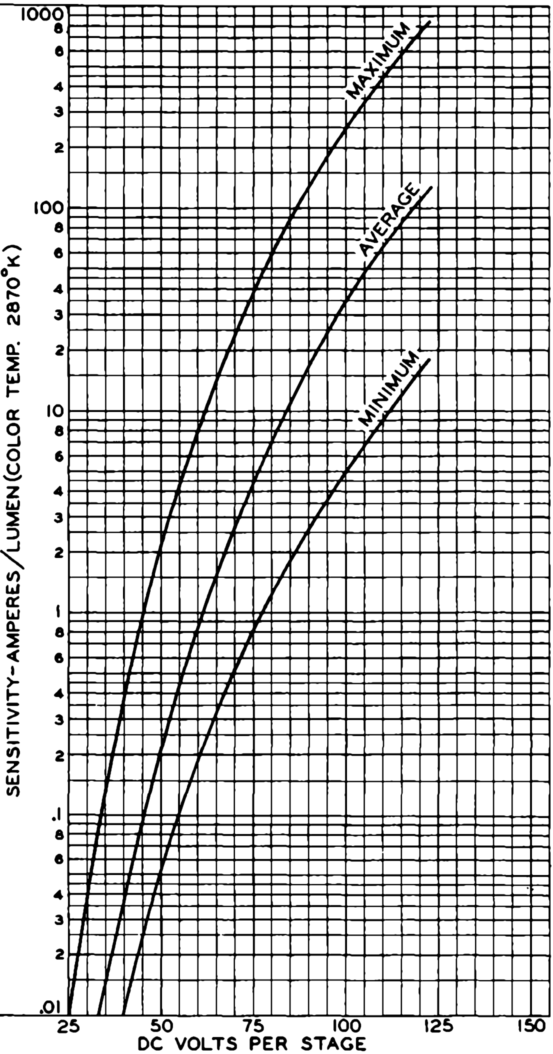
RCA

6328

RANGE OF LUMINOUS SENSITIVITY



6342

MULTIPLIER PHOTOTUBE

10-STAGE, HEAD-ON TYPE WITH
1-11/16" SEMITRANSPARENT CATHODE AND S-11 RESPONSE
SHORT TIME-RESOLUTION CAPABILITY

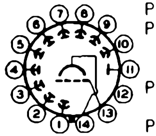
DATA

General:

Spectral Response	S-11	
Wavelength of Maximum Response	4400 ± 500	angstroms
Cathode, Semitransparent:		
Shape	Circular	
Window:		
Area	2.2	sq. in.
Minimum diameter	1-11/16	in.
Index of refraction	1.51	
Direct Interelectrode Capacitances (Approx.):		
Anode to dynode No.10	4.4	$\mu\mu f$
Anode to all other electrodes	7	$\mu\mu f$
Maximum Overall Length	5-13/16"	
Seated Length	4-7/8" ± 3/16"	
Maximum Diameter	2-1/4"	
Mounting Position	Any	
Weight (Approx.)	5.2 oz	
Bulb	T-16	
Base	Medium-Shell Diheptal 14-Pin (JETEC No.B14-38), Non-hygroscopic	

BOTTOM VIEW

Pin 1 - Dynode No.1
Pin 2 - Dynode No.2
Pin 3 - Dynode No.3
Pin 4 - Dynode No.4
Pin 5 - Dynode No.5
Pin 6 - Dynode No.6
Pin 7 - Dynode No.7
Pin 8 - Dynode No.8
Pin 9 - Dynode No.9



DIRECTION OF LIGHT: INTO END OF BULB

Pin 10 - Dynode No.10
Pin 11 - Anode
Pin 12 - Internal Connection-Do Not Use
Pin 13 - Focusing Electrode
Pin 14 - Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	1500 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.10 AND ANODE (DC or Peak AC)	250 max.	volts
DYNODE-No.1 SUPPLY VOLTAGE (DC or Peak AC)	400 max.	volts
FOCUSING-ELECTRODE VOLTAGE (DC or Peak AC)	400 max.	volts
AVERAGE ANODE CURRENT●	2 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

● Averaged over any interval of 30 seconds maximum.

← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6342

6342

MULTIPLIER PHOTOTUBE

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No. 1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode

With E = 1250 volts (except as noted) and Focusing Electrode connected to Dynode No. 1 at socket*

	Min.	Median	Max.	
Sensitivity:				
→ Radiant, at 4400 angstroms	–	6000	–	µamp/µwatt
→ Cathode radiant, at 4400 angstroms	–	0.048	–	µamp/µwatt
Luminous:●				
At 0 cps	3	7.5	100	amp/lumen
Cathode luminous:				
With tungsten light source▲	40	60	–	µamp/lumen
With blue light source⊕♦	0.04	–	–	µamp
Current Amplification	–	125000	–	
Equivalent Anode-Dark-Current Input⊕■	–	2×10^{-10}	2×10^{-9}	lumen
Equivalent Noise Input★	–	7×10^{-12}	–	lumen

With E = 1500 volts (except as noted) and Focusing Electrode connected to Dynode No. 1 at socket*

	Min.	Median	Max.	
Sensitivity:				
→ Radiant, at 4400 angstroms	–	28000	–	µamp/µwatt
→ Cathode radiant, at 4400 angstroms	–	0.048	–	µamp/µwatt
Luminous:●				
At 0 cps	–	35	–	amp/lumen
Cathode luminous:				
With tungsten light source▲	40	60	–	µamp/lumen
With blue light source⊕♦	0.04	–	–	µamp
Current Amplification	–	600000	–	

* In general, the focusing electrode is connected to dynode No. 1 at the socket and operated at the same fixed potential as dynode No. 1. However, in applications critical as to magnitude, uniformity, or speed of the response, the focusing electrode may be connected to the adjustable arm of a potentiometer between cathode and dynode No. 1 in the voltage divider, and operated at an optimum potential within a range of 10 to 60 per cent of the dynode-No. 1 potential.

● 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.

▲, ⊕, ♦, ⊕, ■, ★: See next page. → Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6342

MULTIPLIER PHOTOTUBE

▲ For conditions the same as shown under (♦) except that the value of light flux is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected together as anode.

⊕ Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 200 volts are applied between cathode and all other electrodes connected together as anode.

♦ For spectral characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.

✤ Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

● For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1250 volts is recommended.

★ Under the following conditions: Supply voltage (E) is 1250 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OPERATING CONSIDERATIONS

The *operating stability* of the 6342 is dependent on the magnitude of the anode current and its duration. When the 6342 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 6342 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 2 milliamperes is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 250 microamperes.

Electrostatic and/or *magnetic shielding* of the 6342 may be necessary.

The *material* of which the dynodes of the 6342 are made has stable, high-current carrying capabilities and permits the use of a tube manufacturing process which minimizes regenerative effects such as afterpulses. The relative freedom of the 6342 from afterpulses and its small spread in electron transit time make it particularly useful for fast coincidence scintillation counting.

Because the 6342 offers the advantage of small spread in electron transit time, it has a fast pulse rise time. For an input pulse having a rise time of 1 millimicrosecond or less, the rise time of the pulse at the anode is about

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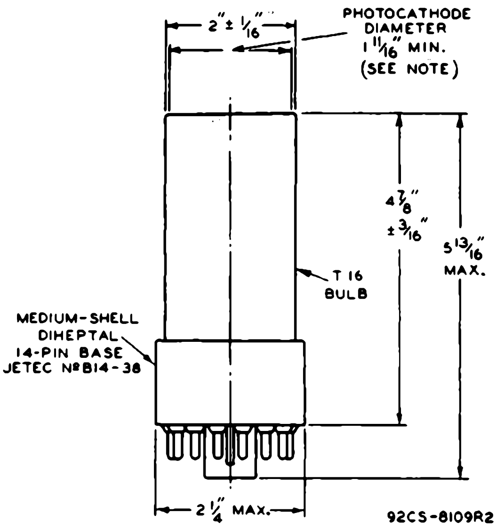
MULTIPLIER PHOTOTUBE

5 millimicroseconds as measured between its 10- and 90-per cent magnitude points when the supply voltage is 1500 volts and the focusing electrode is connected to dynode No. 1.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-11 Response
is shown at the front of this Section



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

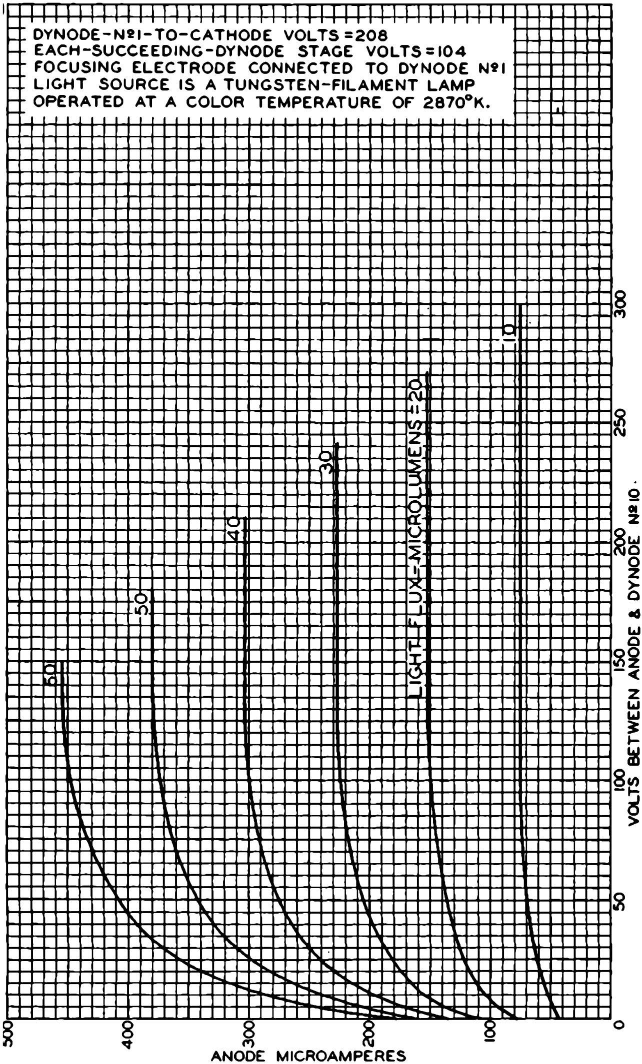
NOTE: WITHIN MINIMUM DIAMETER, DEVIATION FROM FLATNESS WILL NOT EXCEED 0.010" FROM PEAK TO VALLEY.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6342

6342

AVERAGE ANODE CHARACTERISTICS



JULY 27, 1955 TUBE DIVISION 92CM-8125R1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6342

6342

TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC

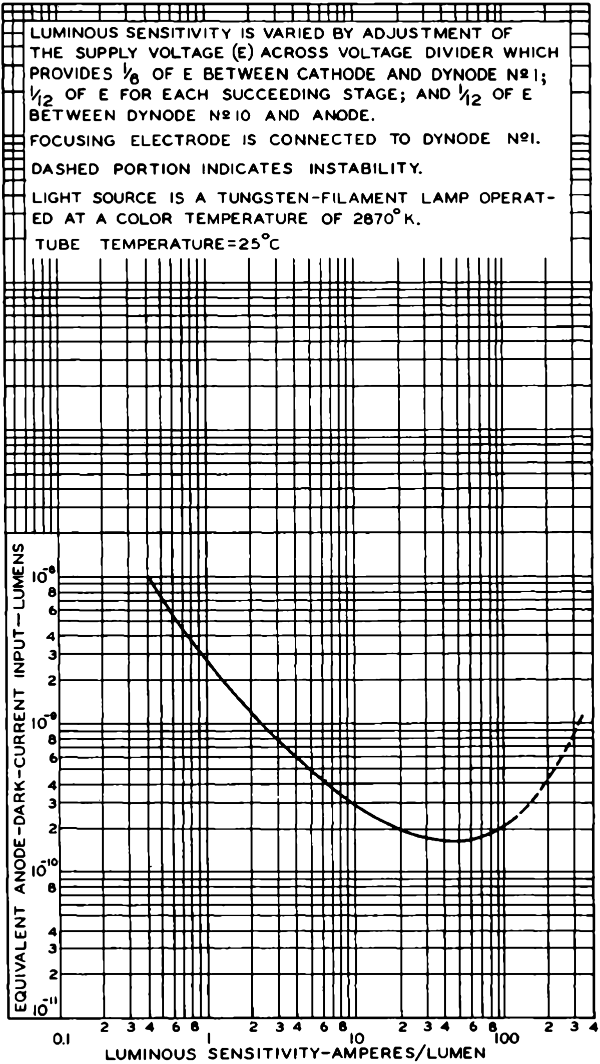
LUMINOUS SENSITIVITY IS VARIED BY ADJUSTMENT OF THE SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER WHICH PROVIDES 1/8 OF E BETWEEN CATHODE AND DYNODE No 1; 1/12 OF E FOR EACH SUCCEEDING STAGE; AND 1/12 OF E BETWEEN DYNODE No 10 AND ANODE.

FOCUSING ELECTRODE IS CONNECTED TO DYNODE No 1.

DASHED PORTION INDICATES INSTABILITY.

LIGHT SOURCE IS A TUNGSTEN-FILAMENT LAMP OPERATED AT A COLOR TEMPERATURE OF 2870° K.

TUBE TEMPERATURE = 25°C



OCT. 15, 1953 TUBE DIVISION 92CM-8124

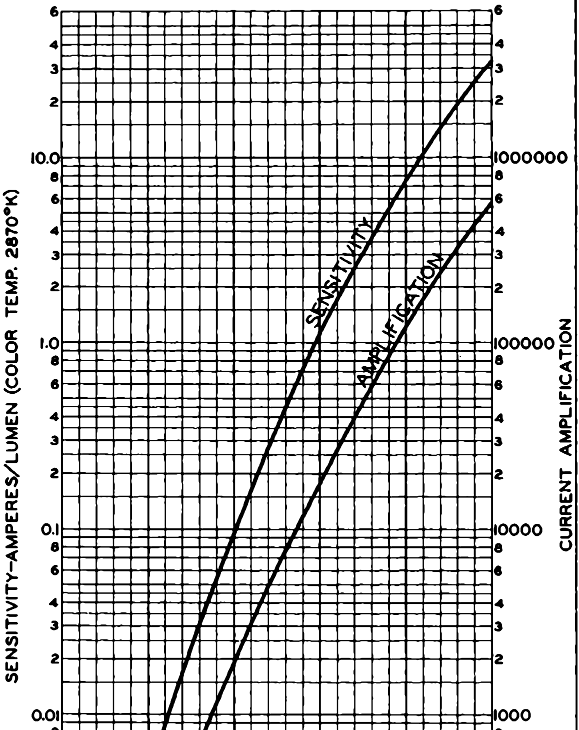
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6342

6342

AVERAGE CHARACTERISTICS

SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER PROVIDING 1/6 OF E BETWEEN CATHODE AND DYNODE №1; 1/12 OF E FOR EACH SUCCEEDING DYNODE STAGE; AND 1/12 OF E BETWEEN DYNODE №10 AND ANODE
FOCUSING ELECTRODE IS CONNECTED TO DYNODE №1



OCT. 15, 1953

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-8123

6372

MULTIPLIER PHOTOTUBE

10-STAGE TYPE WITH
4-1/8" x 3" SEMITRANSPARENT CATHODE AND S-11 RESPONSE

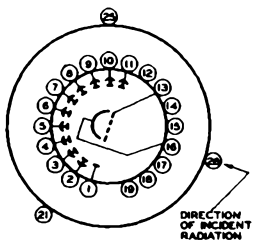
DATA

General:

Spectral Response	S-11	←
Wavelength of Maximum Response	4400 ± 500 angstroms	←
Cathode, Semitransparent:		
Shape	Semicylindrical	
Window:		
Minimum length	4-1/8 in.	
Minimum width (Along circumference of bulb)	3 in.	
Minimum area	12-3/8 sq. in.	
Index of refraction	1.48	
Direct Interelectrode Capacitances (Approx.):		
Anode to dynode No.10	5 μμf	
Anode to all other electrodes	6.5 μμf	
Maximum Overall Length	7-3/4"	
Maximum Seated Length	7-1/4"	
Length from Base Seat to Center of Useful Cathode Area	3-5/8" ± 1/8"	
Maximum Diameter	2-9/16"	
Mounting Position	Any	
Weight (Approx.)	9 oz	
Bulb	T-20	
Base	Small-Button Twentyninar 22-Pin (JETEC No.E22-16)	

BOTTOM VIEW

Pin 1 - Anode
Pin 2 - Dynode No.10
Pin 3 - Dynode No.9
Pin 4 - Dynode No.8
Pin 5 - Dynode No.7
Pin 6 - Dynode No.6
Pin 7 - Dynode No.5
Pin 8 - Dynode No.4
Pin 9 - Dynode No.3
Pin 10 - Dynode No.2
Pin 11 - Dynode No.1
Pin 12 - Internal Connection-Do Not Use
Pin 13 - Focusing Electrode
Pin 14 - Same as Pin 12
Pin 15 - Same as Pin 12
Pin 16 - Cathode
Pin 17 - Same as Pin 12
Pin 18 - Same as Pin 12
Pin 19 - Same as Pin 12
Pin 21 - Same as Pin 12
Pin 25 - Same as Pin 12
Pin 28 - Same as Pin 12



PINS 1-19: ON 1⅞" DIA. PIN CIRCLE
PINS 21,25,28: ON ⅞" DIA. PIN CIRCLE
PIN CIRCLES ARE CONCENTRIC

← Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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MULTIPLIER PHOTOTUBE

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC). . . .	1200 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No. 10 AND ANODE (DC or Peak AC). . . .	180 max.	volts
DYNODE-No. 1 SUPPLY VOLTAGE (DC or Peak AC).	300 max.	volts
FOCUSING-ELECTRODE VOLTAGE (DC or Peak AC).	300 max.	volts
AVERAGE ANODE CURRENT●.	0.75 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across a voltage divider providing 1/12 of E between cathode and focusing electrode; 1/12 of E between focusing electrode and dynode No. 1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode

With E=1000 volts (except as noted)

	Min.	*Median*	*Max.*	
Sensitivity:				
Radiant, at 4400 angstroms. .	-	16000	-	µamp/µwatt
Cathode radiant, at 4400 angstroms	-	0.026	-	µamp/µwatt
Luminous:♦				
At 0 cps.	5	20	-	amp/lumen
At 100 Mc	-	19	-	amp/lumen
Cathode luminous:				
With tungsten light source▲	20	33	-	µamp/lumen
With blue light source†♦	0.026	-	-	µamp
Current Amplification	-	600000	-	
Equivalent Anode-Dark-Current Input♣	-	5×10^{-9}	1×10^{-8}	lumen
Equivalent Noise Input*■	-	1×10^{-10}	-	lumen

● Averaged over any interval of 30 seconds maximum.

♦ For conditions when 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.

▲ For conditions the same as shown under (♦) except that the value of light flux is 0.01 lumen and 150 volts are applied between cathode and all other electrodes connected together as anode.

† Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No. 5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 150 volts are applied between cathode and all other electrodes connected together as anode.

♦, ♣, *, ■: See next page. → Indicates a change.

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MULTIPLIER PHOTOTUBE

♦ For Spectral Characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.

● Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

* Under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

■ For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.

OPERATING CONSIDERATIONS

The *operating stability* of the 6372 is dependent on the magnitude of the anode current and its duration. When the 6372 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 6372 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 0.75 milliampere is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 100 microamperes.

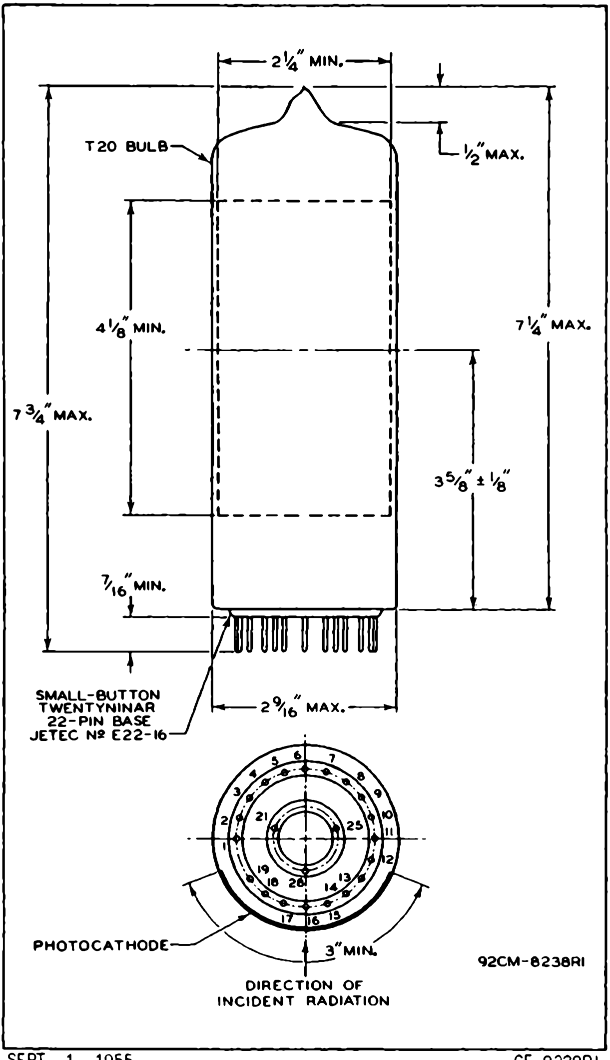
Electrostatic and/or *magnetic shielding* of the 6372 may be necessary.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-11 Response
is shown at the front of this Section

6372

6372

MULTIPLIER PHOTOTUBE



SEPT. 1, 1955

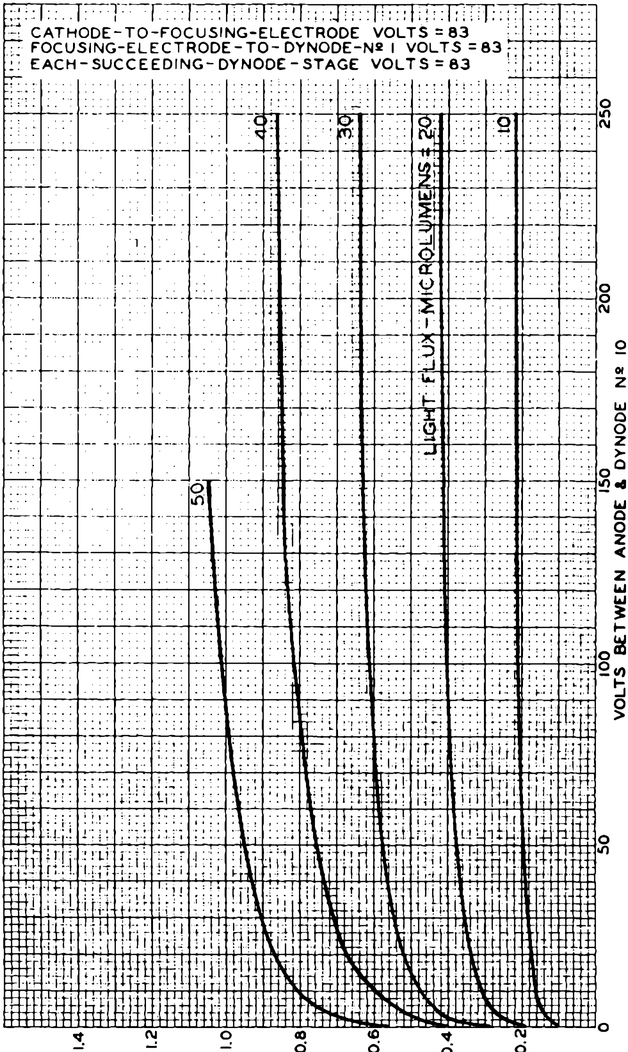
CE-8238R1

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6372

6372

AVERAGE ANODE CHARACTERISTICS



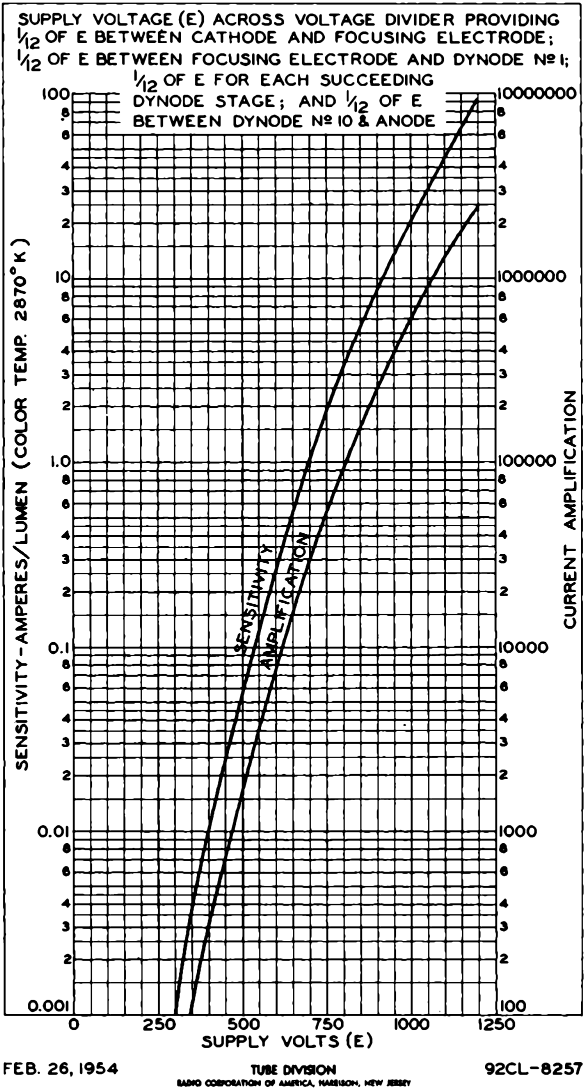
FEB. 26, 1954 — TUBE DIVISION — 92CM-8258

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6372

6372

AVERAGE CHARACTERISTICS



FEB. 26, 1954

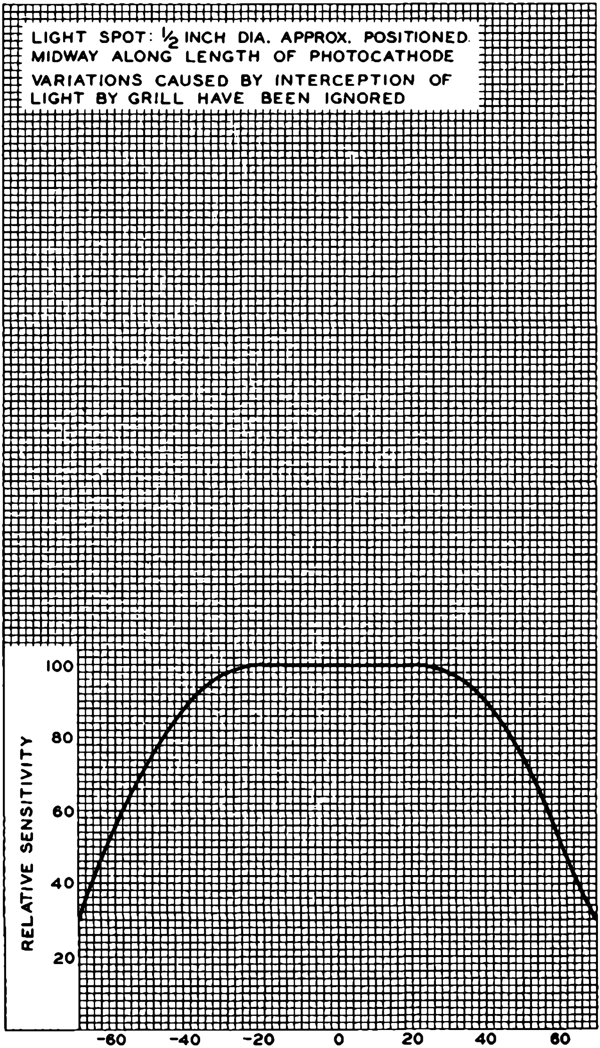
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CL-8257

6372

6372

VARIATION IN SENSITIVITY



APRIL 9, 1954

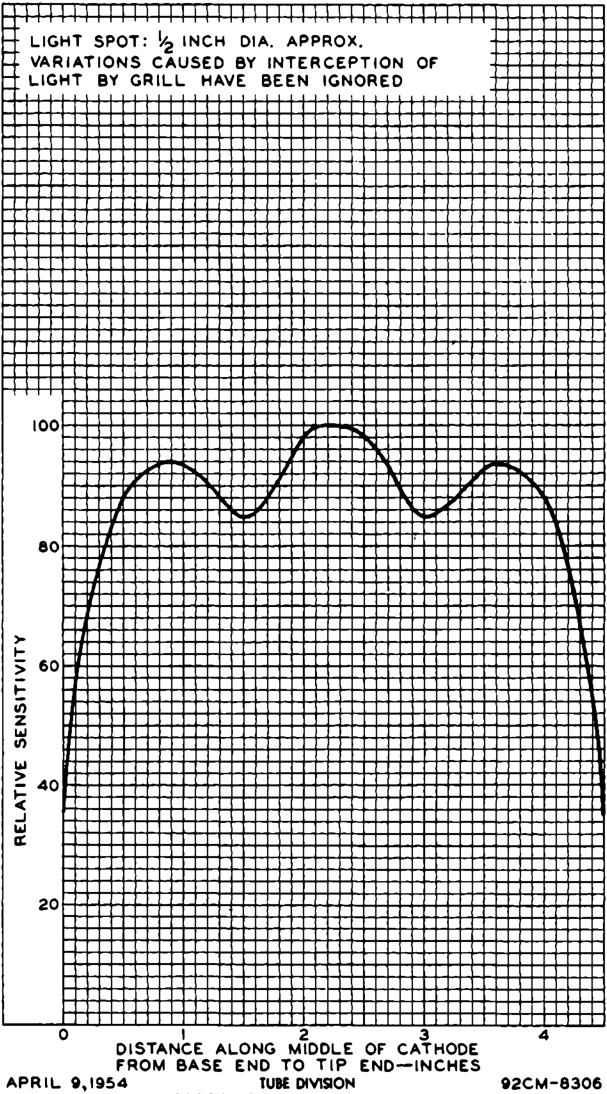
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8304

6372

6372

VARIATION IN SENSITIVITY



APRIL 9,1954

TUBE DIVISION

92CM-8306

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6405/1640

GAS PHOTOTUBE

LOW-MICROPHONIC TYPE WITH S-1 RESPONSE

DATA

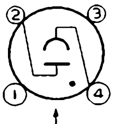
General:

Spectral Response S-1
Wavelength of Maximum Response . . . . 8000 ± 1000 angstroms
Cathode:
  Shape . . . . Semicylindrical
  Minimum projected length* . . . . 1-1/4"
  Minimum projected width*. . . . . 5/8"
Direct Interelectrode Capacitance . . . . 3 μμf
Overall Length . . . . 4-5/16" ± 1/8"
Seated Length . . . . 3-11/16" ± 1/8"
Seated Length to Center of Cathode . . . . . 2-1/8" ± 3/32"
Maximum Diameter . . . . 1-1/8"
Mounting Position . . . . Any
Weight (Approx.) . . . . 1.3 oz
Bulb T-8
Base . . . . Dwarf-Shell Small 4-Pin (JETEC No.A4-26), Non-hygroscopic

BOTTOM VIEW

Pin 1 - No Connection

Pin 2 - Anode



Pin 3 - No Connection

Pin 4 - Cathode

DIRECTION OF LIGHT

Maximum Ratings, *Absolute Values:*

	Rating I	*Rating II*	
ANODE-SUPPLY VOLTAGE (DC or Peak AC)	70 max.	90 max.	volts
AVERAGE CATHODE-CURRENT DENSITY	50 max.	25 max.	μamp/sq.in.
AVERAGE CATHODE CURRENT°	10 max.	5 max.	μamp
AMBIENT TEMPERATURE . . .	100 max.	100 max.	°C

Characteristics at 90 Volts on Anode:

	Min.	*Av.*	*Max.*	
Sensitivity: Radiant at 8000 angstroms . . .	-	0.0135	-	μamp/μwatt

* On plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum.

RCA

6405

GAS PHOTOTUBE

	Min.	*Av.*	*Max.*	
Sensitivity:				
Luminous:▲				
At 0 cps	80	135	200	µamp/lumen
At 5000 cps	-	116	-	µamp/lumen
At 10000 cps	-	100	-	µamp/lumen
Sensitivity Difference Between Highest Value and Lowest Value Along Cathode Length●.	-	-	25	µamp/lumen
Gas Amplification Factor .	-	-	9	
Anode Dark Current:				
At 25°C	-	-	0.1	µamp

Minimum Circuit Values:

With anode-supply voltage of	*70 or less*	*90*	*volts*
DC Load Resistance:			
For dc currents above 5 µamp	0.1 min.	-	megohm
For dc currents below 5 µamp	0 min.	-	megohm
For dc currents above 3 µamp	-	2.5 min.	megohms
For dc currents below 3 µamp	-	0.1 min.	megohm

▲ For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A dc anode supply of 90 volts and a 1-megohm load resistor are used. For the 0-cycle measurements, a light input of 0.1 lumen is used. For the 5000 and 10000-cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean.

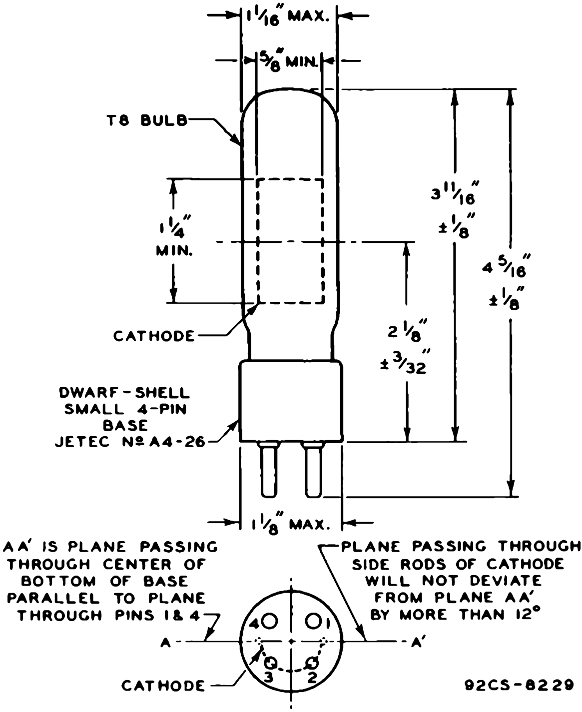
● Measured under the same conditions as indicated under (▲) with light input of 0.1 lumen and a light spot 1/2 inch in diameter.

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
and
FREQUENCY-RESPONSE CHARACTERISTICS
of Gas Phototubes
are shown at the front of this Section

RCA

6405

GAS PHOTOTUBE

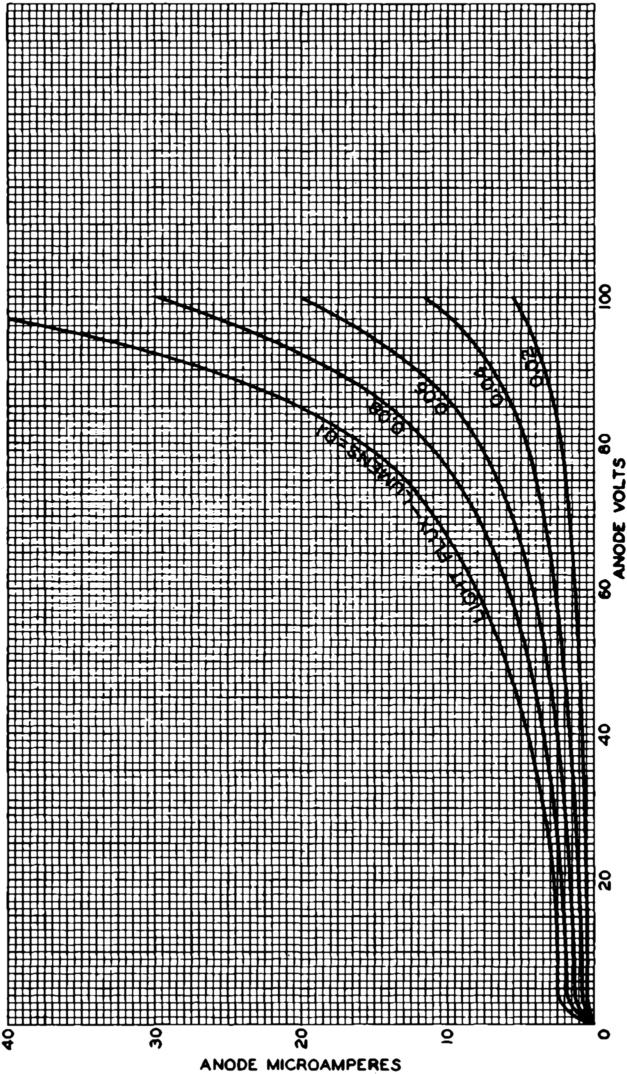


6405

RCA

6405

AVERAGE ANODE CHARACTERISTICS



JAN. 22, 1954

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8227

6472

6472
MULTIPLIER PHOTOTUBE

9-STAGE TYPE WITH S-4 RESPONSE

For Headlight-Control Service

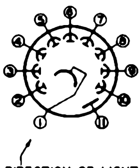
DATA

General:

Spectral Response		S-4
Wavelength of Maximum Response		4000 ± 500 angstroms
Cathode:		
Minimum projected length*		15/16"
Minimum projected width*		5-16"
Direct Interelectrode Capacitances:		
Anode to dynode No.9	4.2	μμf
Anode to all other electrodes	5.5	μμf
Maximum Overall Length (Excluding leads)		2-3/4"
Maximum Envelope Length (Excluding tip)		2-1/4"
Length from Envelope Seal to Center of Useful Cathode Area		1-1/4" ± 3/32"
Maximum Diameter		1-3/16"
Bulb		T-9
Mounting Position		Any
Weight (Approx.)		2 oz
Terminals, Flexible Lead		*See Dimensional Outline*

BOTTOM VIEW

Lead 1 - Cathode
Lead 2 - Dynode No.1
Lead 3 - Dynode No.2
Lead 4 - Dynode No.3
Lead 5 - Dynode No.4
Lead 6 - Dynode No.5



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.

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RCA

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.

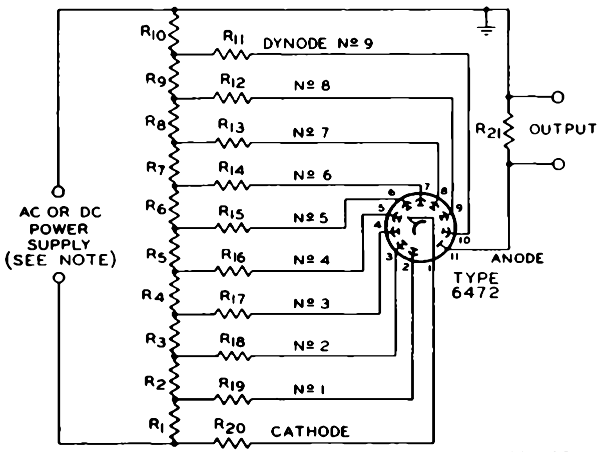
A recommended design of voltage-divider network for use with the 6472 to provide stable operation and long tube life is shown in the accompanying circuit. This design provides linear operation within the range normally required for dimming. At higher light levels, the network design limits the tube output 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.

RCA

6472

MULTIPLIER PHOTOTUBE

RECOMMENDED VOLTAGE-DIVIDER NETWORK FOR USE WITH TYPE 6472 IN HEADLIGHT-DIMMING SERVICE



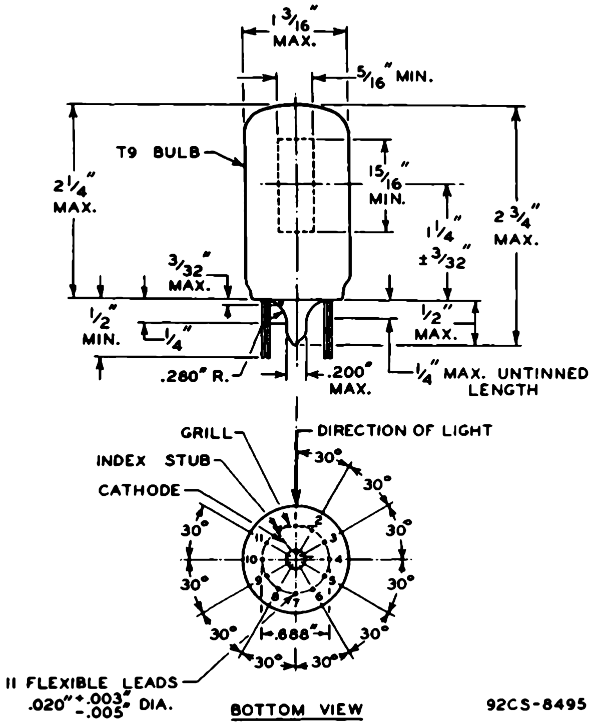
R1 R2 R3 R4 R5
R6 R7 R8 R9 R10: 1 megohm, 1/2 watt
R11: 2 megohms, 1/2 watt
R12: 5.1 megohms, 1/2 watt
R13 R14 R15 R16
R17 R18 R19 R20: 8.2 megohms, 1/2 watt
R21: 820,000 ohms, 1/2 watt

NOTE: Adjustable between approximately 500 and 1000 volts dc or peak ac.

RCA

6472

MULTIPLIER PHOTOTUBE



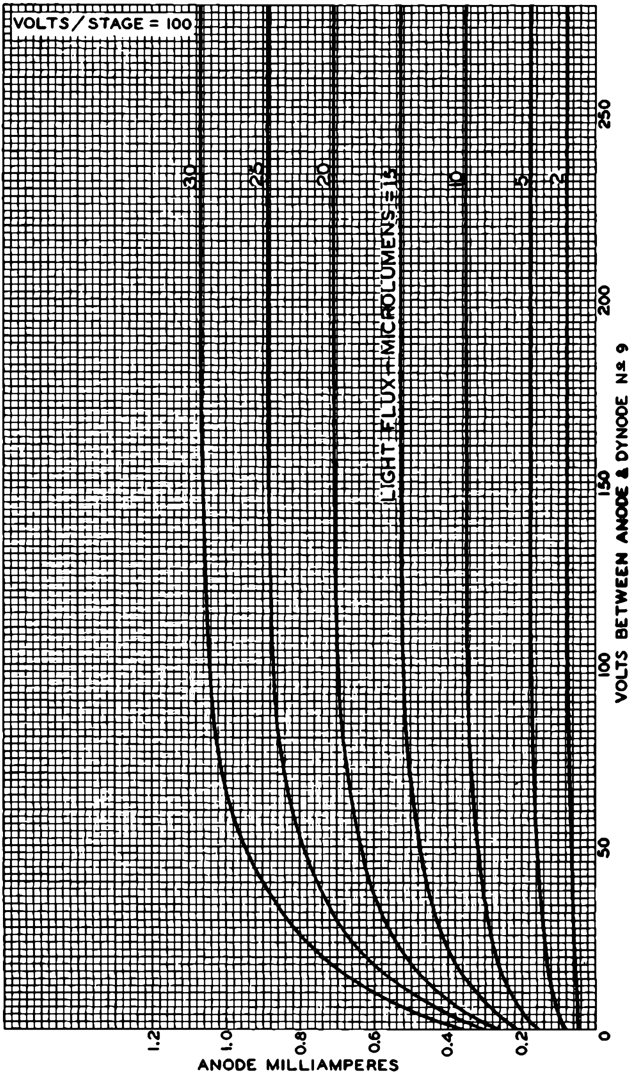
THE ANGULAR VARIATION BETWEEN THE PLANE THROUGH LEAD No. 1 AND TUBE AXIS AND THE PLANE PERPENDICULAR TO THE PLANE OF THE GRILL WILL NOT EXCEED 20°.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-4 Response is shown at front of this Section

6472

6472

AVERAGE ANODE CHARACTERISTICS



JAN. 29, 1955

TUBE DIVISION

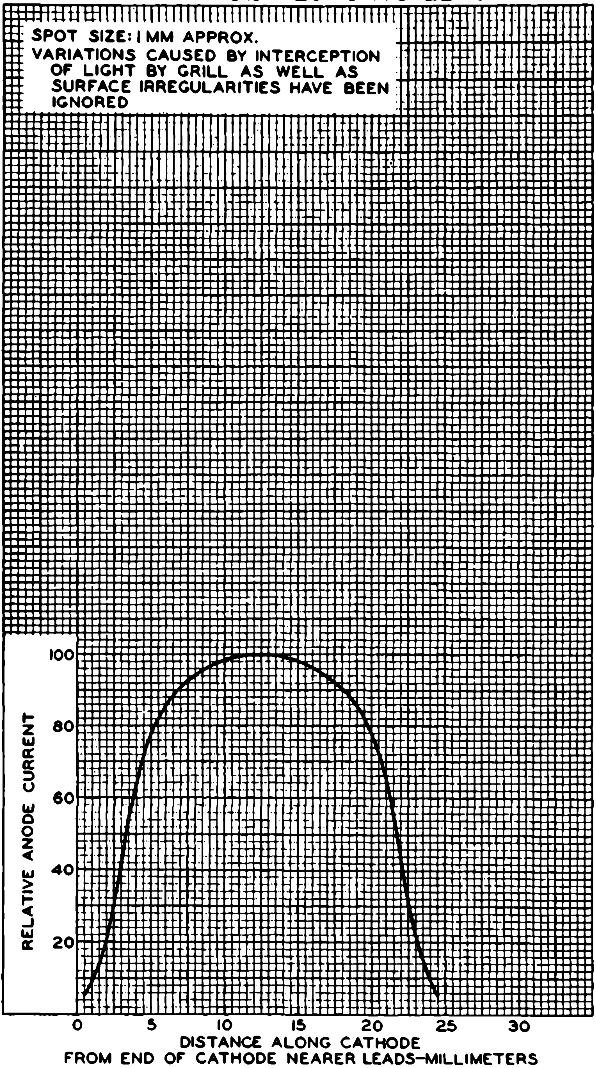
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8029R1

6472

6472

VARIATION IN SENSITIVITY OF PHOTOCATHODE ALONG ITS LENGTH



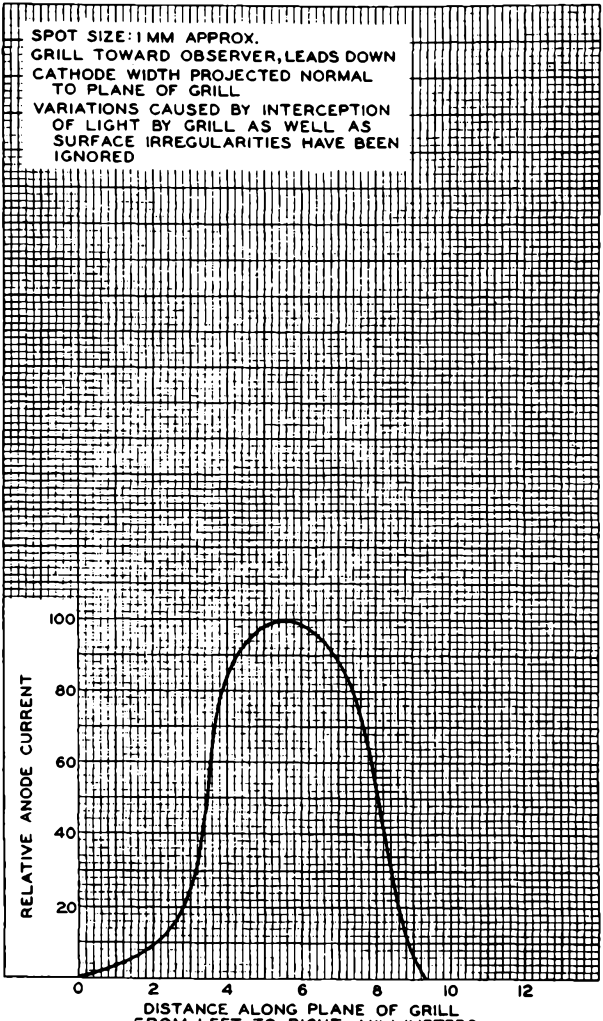
FEB. 11, 1955 TUBE DIVISION 92CM-8535

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6472

VARIATION IN SENSITIVITY OF PHOTOCATHODE ACROSS ITS PROJECTED WIDTH IN PLANE OF GRILL



FEB. 11, 1955

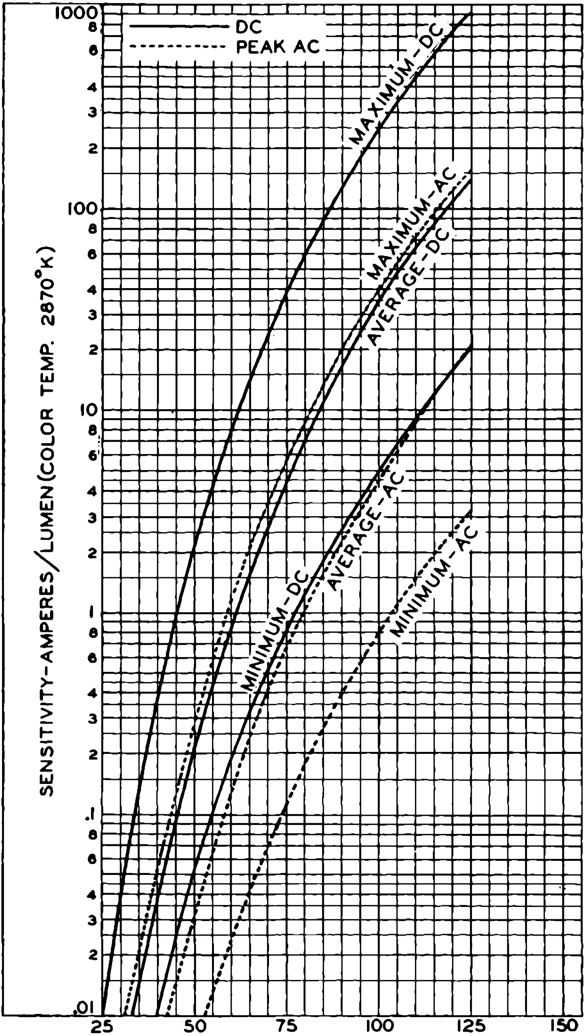
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8536

RCA

6472

RANGE OF LUMINOUS SENSITIVITY



6570

RCA 6570

VACUUM PHOTOTUBE

LOW-MICROPHONIC TYPE WITH S-1 RESPONSE

DATA

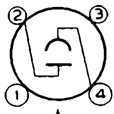
General:

Spectral Response	S-1
Wavelength of Maximum Response	8000 ± 1000 angstroms
Cathode:	
Shape	Semicylindrical
Minimum projected length*	1-1/4"
Minimum projected width*	5/8"
Direct Interelectrode Capacitance	3 $\mu\mu$f
Overall Length	4-5/16" ± 1/8"
Seated Length	3-11/16" ± 1/8"
Seated Length to Center of Cathode	2-1/8" ± 3/32"
Maximum Diameter	1-1/8"
Mounting Position	Any
Weight (Approx.)	1.3 oz
Bulb	T-8
Base	Dwarf-Shell Small 4-Pin (JETEC No.A4-26), Non-hygroscopic

BOTTOM VIEW

Pin 1 - No Connection

Pin 2 - Anode



DIRECTION OF LIGHT

Pin 3 - No Connection

Pin 4 - Cathode

Maximum Ratings, *Absolute Values:*

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	500 max.	volts
AVERAGE CATHODE-CURRENT DENSITY°	25 max.	μamp/sq. in.
AVERAGE CATHODE CURRENT°	5 max.	μamp
AMBIENT TEMPERATURE	100 max.	°C

Characteristics at 250 Volts on Anode:

	Min.	*Av.*	*Max.*	
Sensitivity:				
Radiant at 8000 angstroms	-	0.0027	-	μamp/μwatt
Luminous#	20	30	40	μamp/lumen
Sensitivity Difference Between Highest Value and Lowest Value Along Cathode Length▲	-	-	4.5	μamp/lumen
Anode Dark Current at 25°C	-	-	0.013	μamp

* On plane perpendicular to indicated direction of incident light.

° Averaged over any interval of 30 seconds maximum.

\# For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A dc anode supply of 250 volts, a 1-megohm load resistor, and a light input of 0.1 lumen are used.

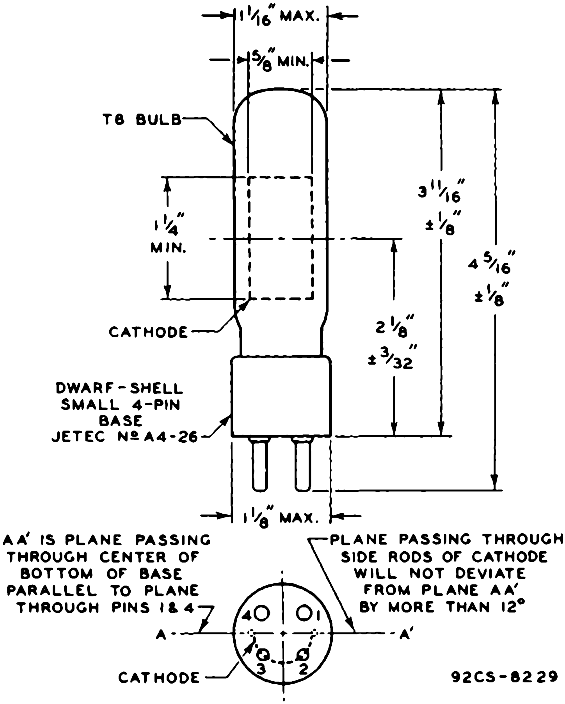
▲ Measured under the same conditions as indicated under (#) with light input of 0.1 lumen and a light spot 1/2 inch in diameter.

RCA

6570

VACUUM PHOTOTUBE

SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-1 Response
is shown at the front of this Section



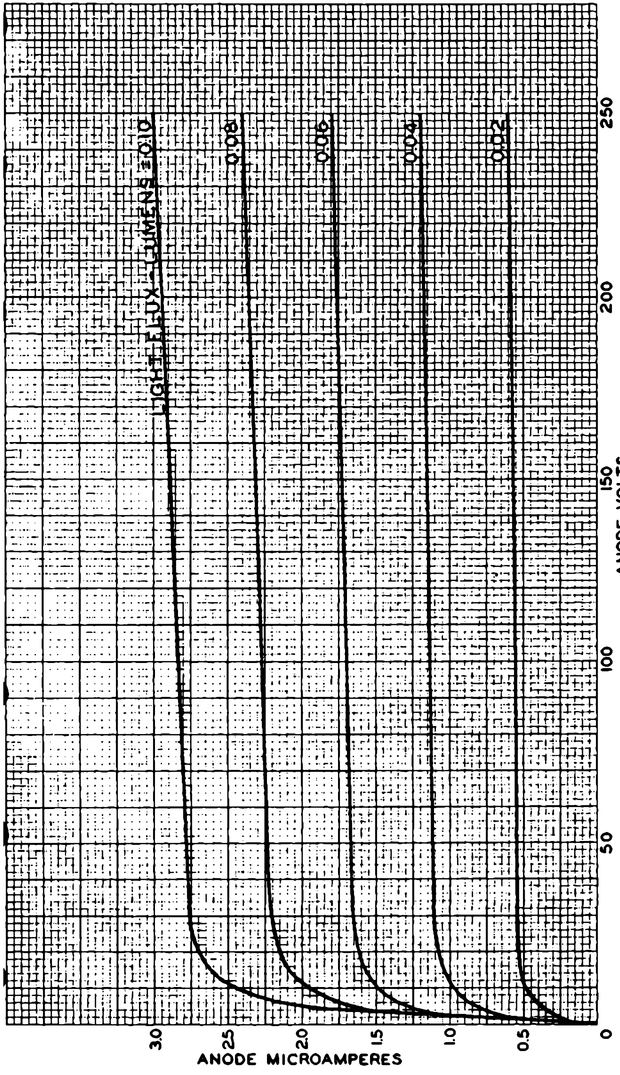
92CS-8229

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6570

AVERAGE ANODE CHARACTERISTICS



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6655

6655

MULTIPLIER PHOTOTUBE

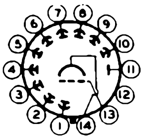
10-STAGE, HEAD-ON TYPE WITH
1-11/16" SEMITRANSPARENT CATHODE AND S-11 RESPONSE

DATA

General:

Spectral Response	S-11	
Wavelength of Maximum Response	4400 ± 500 angstroms	
Cathode, Semitransparent:		
Shape	Circular	
Window:		
Area	2.2	sq. in.
Minimum diameter	1-11/16	in.
Index of refraction	1.51	
Direct Interelectrode Capacitances (Approx.):		
Anode to dynode No.10	4.4	$\mu\mu f$
Anode to all other electrodes	7	$\mu\mu f$
Maximum Overall Length	5-13/16"	
Seated Length	4-7/8" ± 3/16"	
Maximum Diameter	2-5/16" ←	
Mounting Position	Any	
Weight (Approx.)	5.2 oz ←	
Bulb	T-16	
Base	Medium-Shell Diheptal 14-Pin (JETEC No.B14-38), Non-hygroscopic	
Basing Designation for BOTTOM VIEW	14AA ←	

Pin 1 - Dynode No.1
Pin 2 - Dynode No.2
Pin 3 - Dynode No.3
Pin 4 - Dynode No.4
Pin 5 - Dynode No.5
Pin 6 - Dynode No.6
Pin 7 - Dynode No.7
Pin 8 - Dynode No.8
Pin 9 - Dynode No.9



DIRECTION OF LIGHT: INTO END OF BULB

Pin 10 - Dynode No.10
Pin 11 - Anode
Pin 12 - Internal Connection-Do Not Use
Pin 13 - Focusing Electrode
Pin 14 - Cathode

Maximum Ratings, *Absolute Values:*

ANODE-SUPPLY VOLTAGE (DC or Peak AC)	1250 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.10 AND ANODE (DC or Peak AC)	250 max.	volts ←
DYNODE-No.1 SUPPLY VOLTAGE (DC or Peak AC)	300 max.	volts
FOCUSING-ELECTRODE VOLTAGE (DC or Peak AC)	300 max.	volts
AVERAGE ANODE CURRENT●	0.75 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

● Averaged over any interval of 30 seconds maximum.

← Indicates a change.

6655

6655

MULTIPLIER PHOTOTUBE

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No. 1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode

With E = 1000 volts (except as noted) and Focusing Electrode connected to Dynode No. 1 at socket*

	Min.	Median	Max.	
Sensitivity:				
Radiant, at 4400 angstroms . .	-	20000	-	μamp/μwatt
Cathode radiant, at 4400 angstroms . .	-	0.040	-	μamp/μwatt
Luminous:♣				
At 0 cps	10	25	-	amp/lumen
→ With dynode No. 10 as output electrode**.	-	15	-	amp/lumen
Cathode luminous:				
With tungsten light source▲. .	40	50	-	μamp/lumen
With blue light source⊕♦	0.04	-	-	μamp
Current Amplification.	-	500000	-	
Equivalent Anode-Dark-Current Input⊕■. . .	-	8.5×10^{-10}	2×10^{-9}	lumen
→ Equivalent Noise Input★	-	7×10^{-12}	-	lumen
Dark Current to Any Electrode Except Anode (At 25°C). . .	-	-	0.75	μamp

With E = 750 volts (except as noted) and Focusing Electrode connected to Dynode No. 1 at socket*

	Min.	Median	Max.	
Sensitivity:				
Radiant, at 4400 angstroms . .	-	2000	-	μamp/μwatt
Cathode radiant, at 4400 angstroms . .	-	0.040	-	μamp/μwatt
Luminous:♣				
At 0 cps	-	2.5	-	amp/lumen
Cathode luminous:				
With tungsten light source▲. .	40	50	-	μamp/lumen
With blue light source⊕♦	0.04	-	-	μamp
Current Amplification.	-	50000	-	

♣ 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.

*, **, ▲, ⊕, ♦, ⊕, ■, ★: See next page.

→ Indicates a change.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6655

MULTIPLIER PHOTOTUBE

* In general, the focusing electrode is connected to dynode No.1 at the socket and operated at the same fixed potential as dynode No.1. However, in applications critical as to magnitude, uniformity, or speed of the response, the focusing electrode may be connected to the adjustable arm of a potentiometer between cathode and dynode No.1 in the voltage divider, and operated at an optimum potential within a range of 10 to 60 per cent of the dynode-No.1 potential.

** An output current of opposite polarity to that obtained at the anode may be provided by using dynode No.10 as the output electrode. With this arrangement, the load is connected in the dynode-No.10 circuit and the anode serves only as collector. ←

▲ For conditions the same as shown under (♠) except that the value of light flux is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected together as anode.

⊕ Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 200 volts are applied between cathode and all other electrodes connected together as anode.

♦ For spectral characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.

♣ Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

● For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.

★ Under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses. ←

OPERATING CONSIDERATIONS

The *operating stability* of the 6655 is dependent on the magnitude of the anode current and its duration. When the 6655 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 6655 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 0.75 milliampere is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 100 microamperes.

Electrostatic and/or *magnetic shielding* of the 6655 may be necessary.

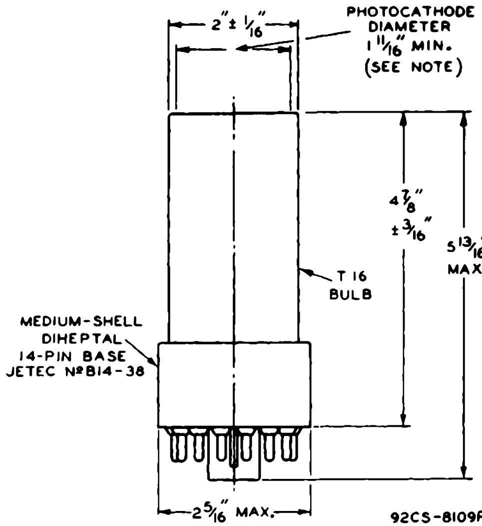
SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-11 Response is shown at the front of this Section

← Indicates a change.

RCA

6655

MULTIPLIER PHOTOTUBE



92CS-8109R3

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

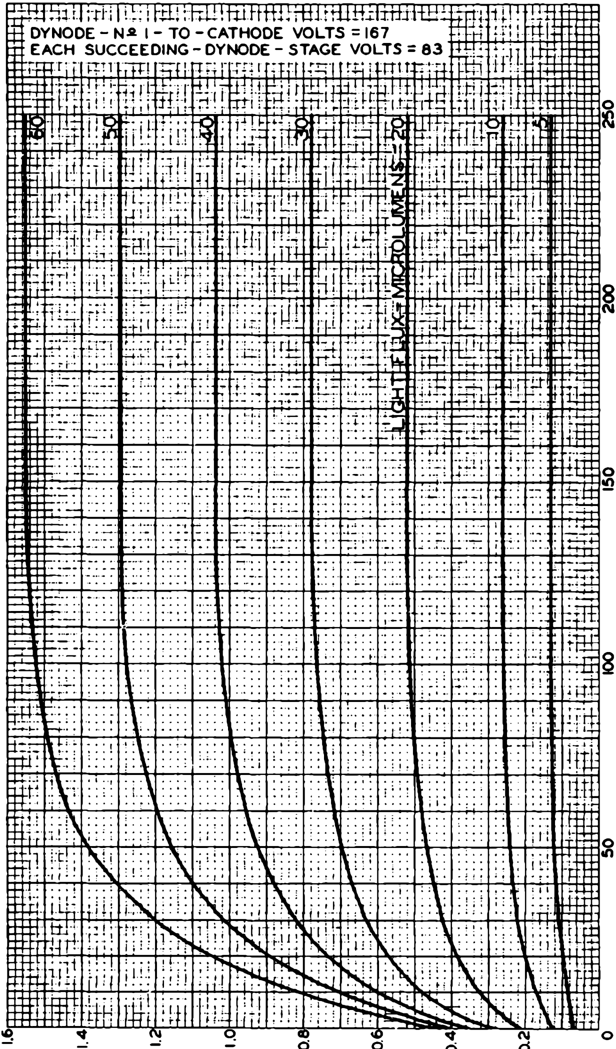
NOTE: WITHIN MINIMUM DIAMETER, DEVIATION FROM FLATNESS WILL NOT EXCEED 0.010" FROM PEAK TO VALLEY.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6655

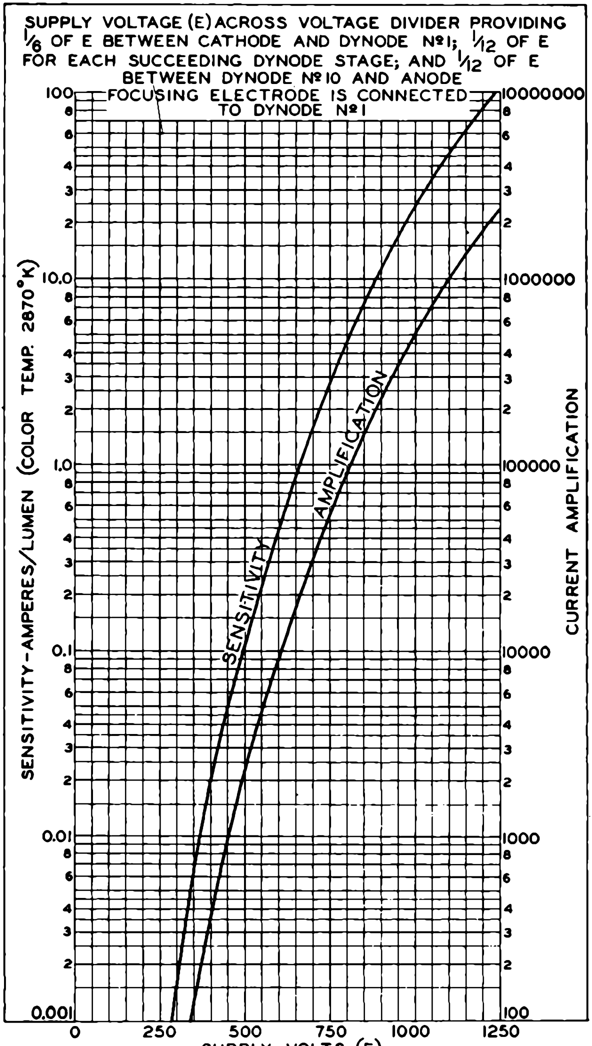
AVERAGE ANODE CHARACTERISTICS



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6655

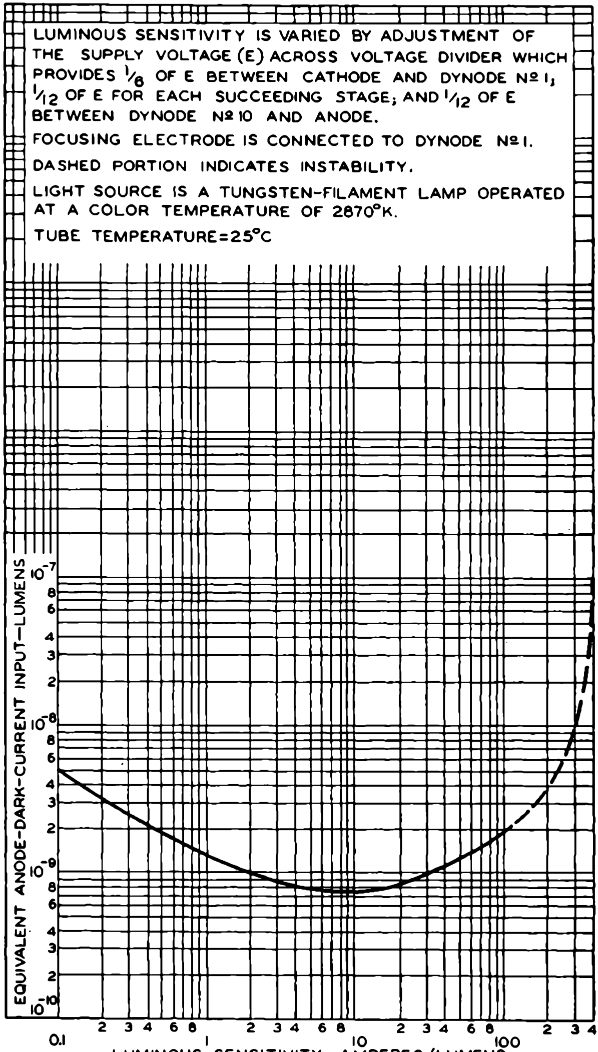
AVERAGE CHARACTERISTICS



MAY 27, 1955 TUBE DIVISION 92CL-8638

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

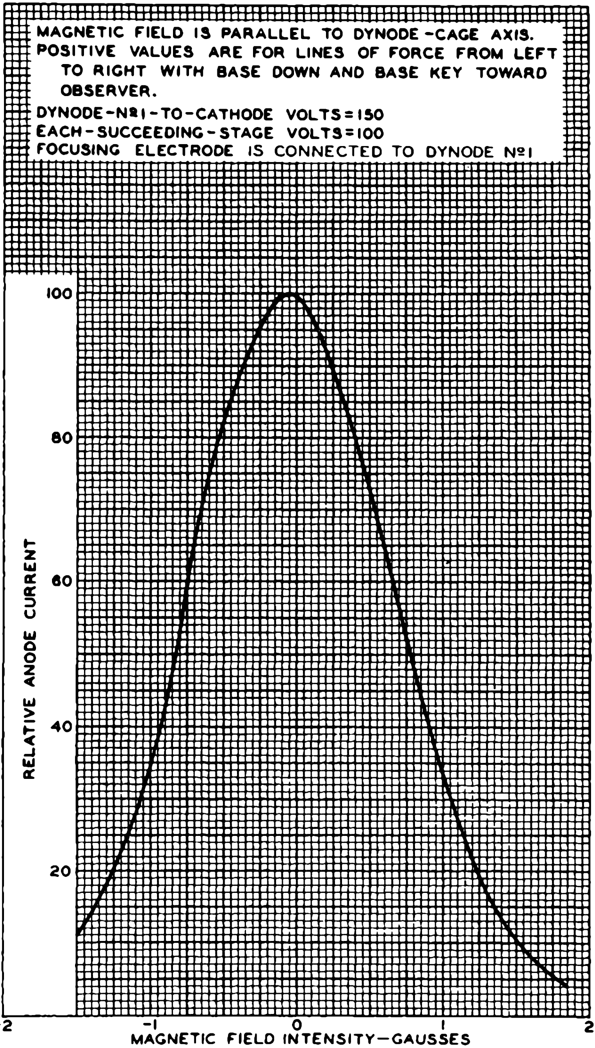
TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



RCA

6655

EFFECT OF MAGNETIC FIELD ON ANODE CURRENT



6810

6810
MULTIPLIER PHOTOTUBE

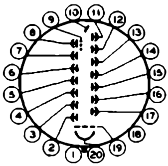
14-STAGE, HEAD-ON TYPE WITH
1-11/16" SEMITRANSPARENT CATHODE AND S-11 RESPONSE
SHORT TIME-RESOLUTION CAPABILITY

DATA

General:

Spectral Response		S-11
Wavelength of Maximum Response	4400 ± 500	angstroms
Cathode, Semitransparent:		
Shape		Circular
Window:		
Area	2.2	sq. in.
Minimum diameter	1-11/16	in.
Index of refraction	1.51	
Direct Interelectrode Capacitances (Approx.):		
Anode to dynode No.14	2.4	μμf
Anode to all other electrodes	5.5	μμf
Dynode No.14 to all other electrodes	7.5	μμf
Maximum Overall Length		7-1/2"
Seated Length		6-11/16" ± 3/16"
Maximum Diameter		2-3/8"
Mounting Position		Any
Weight (Approx.)		8 oz
Bulb		T-16
Base		Small-Shell Bidecal 20-Pin (JETEC No.B20-102), Non-hygroscopic
Basing Designation for BOTTOM VIEW		20B

Pin 1 - No Connection
Pin 2 - Dynode No.1
Pin 3 - Dynode No.3
Pin 4 - Dynode No.5
Pin 5 - Dynode No.7
Pin 6 - Dynode No.9
Pin 7 - Dynode No.11
Pin 8 - Dynode No.13
Pin 9 - Grid No.2 (Accelerating Electrode)
Pin 10 - Anode



DIRECTION OF LIGHT: INTO END OF BULB

Pin 11 - Dynode No.14
Pin 12 - Dynode No.12
Pin 13 - Dynode No.10
Pin 14 - Dynode No.8
Pin 15 - Dynode No.6
Pin 16 - Dynode No.4
Pin 17 - Dynode No.2
Pin 18 - No Connection
Pin 19 - Grid No.1 (Focusing Electrode)
Pin 20 - Photocathode

Maximum Ratings, *Absolute Values:*

ANODE-SUPPLY VOLTAGE (DC)	2300 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.14 AND ANODE (DC)	400 max.	volts
SUPPLY VOLTAGE BETWEEN ACCELERATING-ELECTRODE AND DYNODE No.13 (DC)	±500 max.	volts
DYNODE-No.1 SUPPLY VOLTAGE (DC)	400 max.	volts
FOCUSING-ELECTRODE SUPPLY VOLTAGE (DC)	400 max.	volts
AVERAGE ANODE CURRENT●	2 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

● Averaged over any interval of 30 seconds maximum.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6810

MULTIPLIER PHOTOTUBE

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across a voltage divider providing electrode voltages shown in Table 1

With E = 2000 volts (except as noted) and Accelerating-Electrode Voltage adjusted to give maximum gain

	Min.	Median	Max.	
Sensitivity:				
Radiant, at 4400 angstroms	-	0.6	-	amp/μwatt
Cathode radiant, at 4400 angstroms	-	0.048	-	μamp/μwatt
Luminous:♠				
At 0 cps	120	750	4500	amp/lumen
With dynode No.14 as output electrode†	-	525	-	amp/lumen
Cathode luminous:				
With tungsten light source▲	40	60	-	μamp/lumen
With blue light source⊕♦	0.04	-	-	μamp
Current Amplification	-	12.5×10^6	-	
Equivalent Anode-Dark-Current Input⊕■	-	5×10^{-10}	2×10^{-9}	lumen
Equivalent Noise Input★	-	6×10^{-12}	-	lumen
Dark Current to Any Electrode Except Anode (At 25°C)	-	-	0.75	μamp

With E = 2300 volts (except as noted) and Accelerating-Electrode Voltage adjusted to give maximum gain

	Min.	Median	Max.	
Sensitivity:				
Radiant, at 4400 angstroms	-	3.2	-	amp/μwatt
Cathode radiant, at 4400 angstroms	-	0.048	-	μamp/μwatt
Luminous:♠				
At 0 cps	660	4000	28000	amp/lumen
With dynode No.14 as output electrode†	-	2800	-	amp/lumen
Cathode luminous:				
With tungsten light source▲	40	60	-	μamp/lumen
With blue light source⊕♦	0.04	-	-	μamp
Current Amplification	-	66×10^6	-	

♠,†,▲,⊕,♦,⊕,■,★: See next page.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

MULTIPLIER PHOTOTUBE

TABLE I

VOLTAGE TO BE PROVIDED BY DIVIDER

Between	5.4% of Supply Voltage (E) multiplied by
Cathode and Focusing Electrode	1
Focusing Electrode and Dynode No.1	1
Dynode No.1 and Dynode No.2	1
Dynode No.2 and Dynode No.3	1
Dynode No.3 and Dynode No.4	1
Dynode No.4 and Dynode No.5	1
Dynode No.5 and Dynode No.6	1
Dynode No.6 and Dynode No.7	1
Dynode No.7 and Dynode No.8	1
Dynode No.8 and Dynode No.9	1
Dynode No.9 and Dynode No.10	1
Dynode No.10 and Dynode No.11	1
Dynode No.11 and Dynode No.12	1.25
Dynode No.12 and Dynode No.13	1.5
Dynode No.13 and Dynode No.14	1.75
Dynode No.14 and Anode	2
Anode and Cathode	18.5

♠ For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870°K. A light input of 0.1 microlumen is used. The load resistor has a value of 0.01 megohm.

† An output current of opposite polarity to that obtained at the anode may be provided by using dynode No.14 as the output electrode. With this arrangement, the load is connected in the dynode-No.14 circuit and the anode serves only as collector. The value of sensitivity at dynode No.14 is approximately 70% of that when the anode is the output electrode. Specifically, the sensitivity measured at dynode No. 14 is equal to (1-1/g) times the sensitivity measured at the anode, where "g" is the gain of the dynode-No.14 stage.

▲ For conditions the same as shown under (♠) except that the value of light flux is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected together as anode.

⊕ Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 200 volts are applied between cathode and all other electrodes connected together as anode.

♦ For spectral characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.

✠ Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 2000 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

■ For maximum signal-to-noise ratio, operation with a supply voltage (E) below 2000 volts is recommended.

★ Under the following conditions: Supply voltage (E) is 2000 volts, 25°C tube temperature, external shield potential of -2000 volts, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6810

MULTIPLIER PHOTOTUBE

OPERATING CONSIDERATIONS

The *operating stability* of the 6810 is dependent on the magnitude of the anode current and its duration. When the 6810 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 6810 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum rated value of 2 milliamperes is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 250 microamperes.

Electrostatic and/or *magnetic shielding* of the 6810 may be necessary.

The *material* of which the dynodes of the 6810 are made has stable, high-current carrying capabilities and permits the use of a tube manufacturing process which minimizes regenerative effects such as afterpulses. The relative freedom of the 6810 from afterpulses and its small spread in electron transit time make it particularly useful for fast coincidence scintillation counting.

Because the 6810 offers the advantage of small spread in electron transit time, it has a fast pulse rise time. As a result, the 6810 has very short time-resolution capability, i.e., in the order of 1 or 2 millimicroseconds. For an input pulse having a duration of 1 millimicrosecond or less, the time spread of the pulse at the anode is about 9 millimicroseconds measured at 50 per cent of the maximum pulse height, when the supply voltage is 2000 volts and the focusing electrode is connected to dynode No. 1.

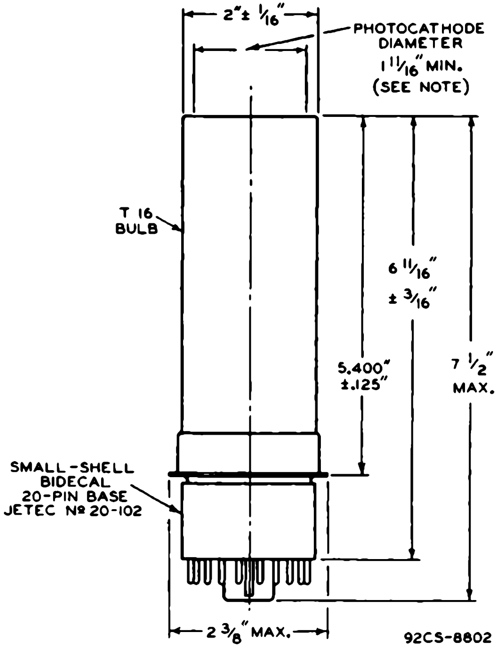
SPECTRAL-SENSITIVITY CHARACTERISTIC
of Phototube having S-11 Response
is shown at the front of this Section

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6810

6810

MULTIPLIER PHOTOTUBE



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

NOTE: WITHIN MINIMUM DIAMETER, DEVIATION FROM FLATNESS WILL NOT EXCEED 0.010" FROM PEAK TO VALLEY.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6810

RCA

6810

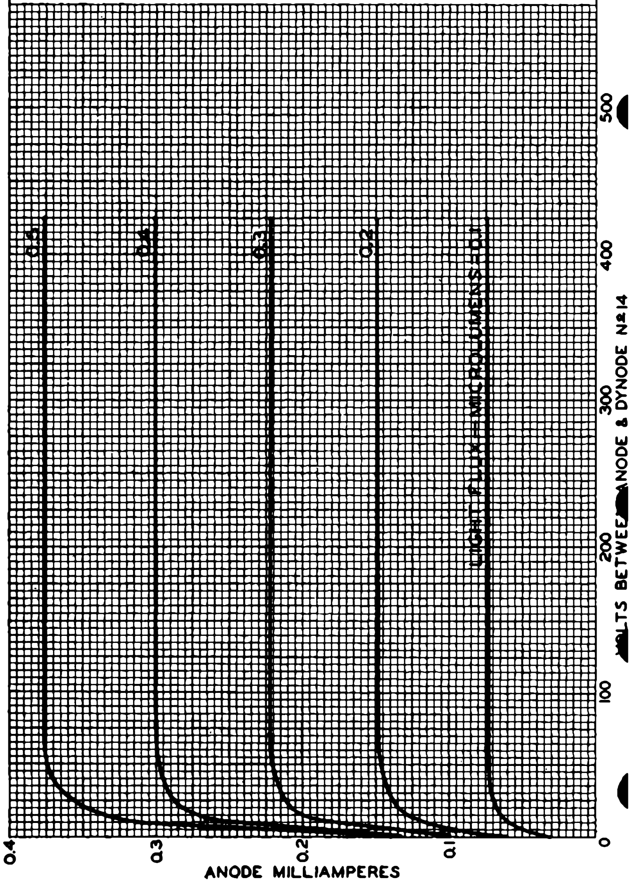
AVERAGE ANODE CHARACTERISTICS

CATHODE-TO-GRID-№1 VOLTS = 108
GRID-№1-TO-DYNODE №1 (DY_1) VOLTS = 108

DY_1-TO-DY_2, DY_2-TO-DY_3 ETC. TO DY_{10}-TO-DY_{11} VOLTS = 108

DY_{11}-TO-DY_{12} VOLTS = 135
DY_{12}-TO-DY_{13} VOLTS = 160
DY_{13}-TO-DY_{14} VOLTS = 189
GRID-№2 VOLTS ADJUSTED TO GIVE MAX. GAIN

LIGHT SOURCE IS TUNGSTEN FILAMENT LAMP OPERATED AT A COLOR TEMPERATURE OF 2870°K.



RCA

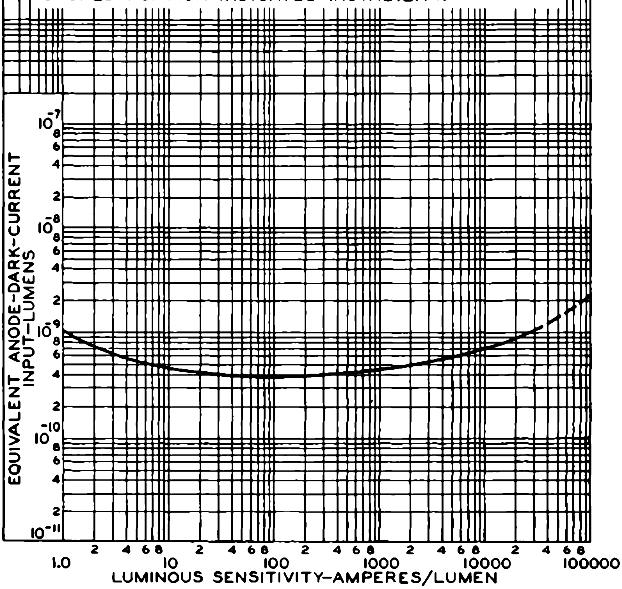
6810

TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC

LUMINOUS SENSITIVITY IS VARIED BY ADJUSTMENT OF THE SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER WHICH PROVIDES VOLTAGES AS FOLLOWS:

BETWEEN	5.4 % OF E MULTIPLIED BY
CATHODE & GRID №1	1
GRID №1 & DYNODE №1 (DY_1)	1
DY_1 & DY_2	1
DY_2 & DY_3	1
DY_3 & DY_4	1
DY_4 & DY_5	1
DY_5 & DY_6	1
DY_6 & DY_7	1
DY_7 & DY_8	1
DY_8 & DY_9	1
DY_9 & DY_{10}	1
DY_{10} & DY_{11}	1
DY_{11} & DY_{12}	1.25
DY_{12} & DY_{13}	1.50
DY_{13} & DY_{14}	1.75
DY_{14} & ANODE	2.
ANODE & CATHODE	18.5

GRID-№2 VOLTS ADJUSTED TO GIVE MAX. GAIN.
LIGHT SOURCE IS A TUNGSTEN-FILAMENT LAMP OPERATED AT A COLOR TEMPERATURE OF 2870°K.
TUBE TEMPERATURE=25°C
DASHED PORTION INDICATES INSTABILITY.



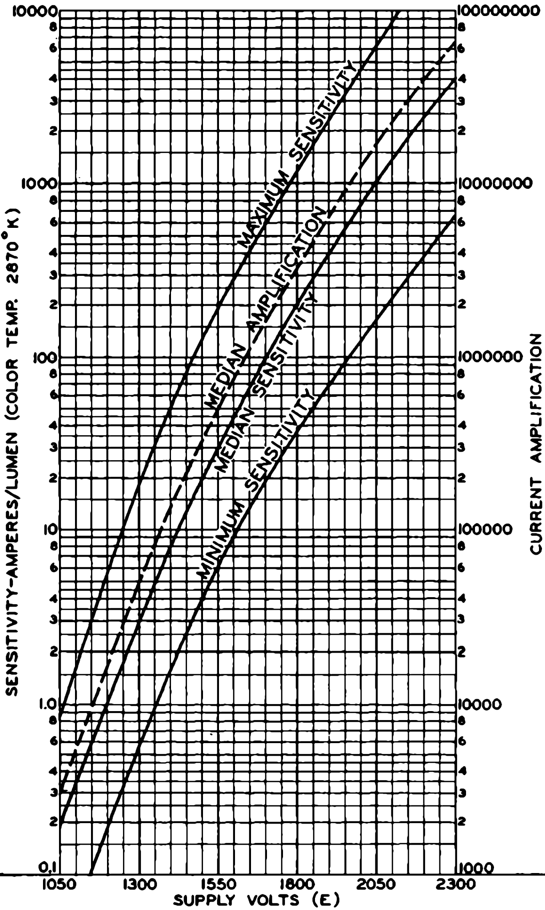
TUBE DIVISION 92CM-8848

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

6810
CHARACTERISTICS

CATHODE-TO-GRID-No.1 VOLTS=108
GRID-No.1-TO-DYNODE-No.1 (DY1) VOLTS=108
DY1-TO-DY2, DY2-TO-DY3 ETC. TO DY10-TO-DY11 VOLTS=108
DY11-TO-DY12 VOLTS=135
DY12-TO-DY13 VOLTS=160
DY13-TO-DY14 VOLTS=189
DY14-TO-ANODE VOLTS=216
GRID-No.2 VOLTS ADJUSTED TO GIVE MAX. GAIN



92CL-8845

6903

6903
MULTIPLIER PHOTOTUBE

10-STAGE, HEAD-ON TYPE WITH

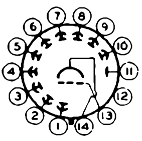
1-5/8" SEMITRANSPARENT CATHODE AND S-13 RESPONSE

DATA

General:

Spectral Response		S-13
Wavelength of Maximum Response.	4400 ± 500	angstroms
Cathode, Semitransparent:		
Shape		Circular
Window:		
Area.	2.0	sq. in.
Minimum diameter.	1-5/8	in.
Index of refraction at 2000 angstroms .	1.51	
Direct Interelectrode Capacitances (Approx.):		
Anode to dynode No.10	4.4	μμf
Anode to all other electrodes	7	μμf
Maximum Overall Length.		6-9/16"
Seated Length	5-5/8" ± 3/16"	
Maximum Diameter.		2-5/16"
Mounting Position		Any
Weight (Approx.).		7 oz
Bulb.		T-16
Faceplate		Fused Silica
Maximum thickness		0.150"
Base. . . . . Medium-Shell Diheptal 14-Pin (JETEC No.B14-38) Non-hygroscopic		
Basing Designation for BOTTOM VIEW		14AA

Pin 1 - Dynode No.1
Pin 2 - Dynode No.2
Pin 3 - Dynode No.3
Pin 4 - Dynode No.4
Pin 5 - Dynode No.5
Pin 6 - Dynode No.6
Pin 7 - Dynode No.7
Pin 8 - Dynode No.8
Pin 9 - Dynode No.9



DIRECTION OF LIGHT: INTO END OF BULB

Pin 10 - Dynode No.10
Pin 11 - Anode
Pin 12 - Internal Connection-Do Not Use
Pin 13 - Focusing Electrode
Pin 14 - Cathode

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

ANODE-SUPPLY VOLTAGE (DC or Peak AC). . . .	1250 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.10 AND ANODE (DC or Peak AC)	250 max.	volts
DYNODE-No.1 SUPPLY VOLTAGE (DC or Peak AC)	300 max.	volts
FOCUSING-ELECTRODE VOLTAGE (DC or Peak AC)	300 max.	volts
AVERAGE ANODE CURRENT●	0.75 max.	ma
AMBIENT TEMPERATURE	75 max.	°C

● Averaged over any interval of 30 seconds maximum.

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MULTIPLIER PHOTOTUBE

Characteristics Range Values for Equipment Design:

Under conditions with supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No. 1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode

With E = 1000 volts (except as noted) and Focusing Electrode connected to Dynode No. 1 at socket*

	Min.	Median	Max.	
Sensitivity:				
Radiant, at 4400 angstroms . .	-	19000	-	μamp/μwatt
Cathode radiant, at 4400 angstroms . .	-	0.047	-	μamp/μwatt
Luminous:♣				
At 0 cps	8	24	240	amp/lumen
With dynode No.10 as output electrode**.	-	14	-	amp/lumen
Cathode luminous:				
With tungsten light source▲. .	40	60	-	μamp/lumen
With blue light source⊕♦	0.04	-	-	μamp
Current Amplification.	-	400000	-	
Equivalent Anode-Dark-Current Input⊕■. . .	-	1×10^{-9}	3×10^{-9}	lumen
Equivalent Noise Input:				
Luminous★.	-	6.7×10^{-12}	-	lumen
Ultraviolet†	-	1.6×10^{-14}	-	watt
Dark Current to Any Electrode Except Anode (At 25°C). . .	-	-	0.75	μamp

With E = 750 volts (except as noted) and Focusing Electrode connected to Dynode No. 1 at socket*

	Min.	Median	Max.	
Sensitivity:				
Radiant, at 4400 angstroms . .	-	1650	-	μamp/μwatt
Cathode radiant, at 4400 angstroms . .	-	0.047	-	μamp/μwatt
Luminous:♣				
At 0 cps	-	2.1	-	amp/lumen
With dynode No.10 as output electrode**.	-	1	-	amp/lumen

♣ 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.

*, **, ▲, ⊕, ♦, ⊕, ■, ★, †: See next page.

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MULTIPLIER PHOTOTUBE

	Min.	Median	Max.	
Cathode luminous:				
With tungsten light source▲ . .	40	60	-	µamp/lumen
With blue light source⊕♦	0.04	-	-	µamp
Current Amplification.	-	35000	-	

* In general, the focusing electrode is connected to dynode No.1 at the socket and operated at the same fixed potential as dynode No.1. However, in applications critical as to magnitude, uniformity, or speed of the response, the focusing electrode may be connected to the adjustable arm of a potentiometer between cathode and dynode No.1 in the voltage divider, and operated at an optimum potential within a range of 10 to 60 per cent of the dynode-No.1 potential.

** An output current of opposite polarity to that obtained at the anode may be provided by using dynode No.10 as the output electrode. With this arrangement, the load is connected in the dynode-No.10 circuit and the anode serves only as collector.

▲ For conditions the same as shown under (♠) except that the value of light flux is 0.01 lumen and 150 volts are applied between cathode and all other electrodes connected together as anode.

⊕ Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870°K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 150 volts are applied between cathode and all other electrodes connected together as anode.

♦ For spectral characteristic of this source, see sheet SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.

♣ Measured at a tube temperature of 25°C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

■ For maximum signal-to-noise ratio operation with a supply voltage (E) below 1000 volts is recommended.

★ Under the following conditions: Supply voltage (E) is 1000 volts, 25°C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870°K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

† Determined under the same conditions as shown under (★) except that use is made of monochromatic source having radiation of 2537 angstroms.

OPERATING CONSIDERATIONS

The *operating stability* of the 6903 is dependent on the magnitude of the anode current and its duration. When the 6903 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 6903 usually recovers a substantial percentage of such loss in sensitivity.

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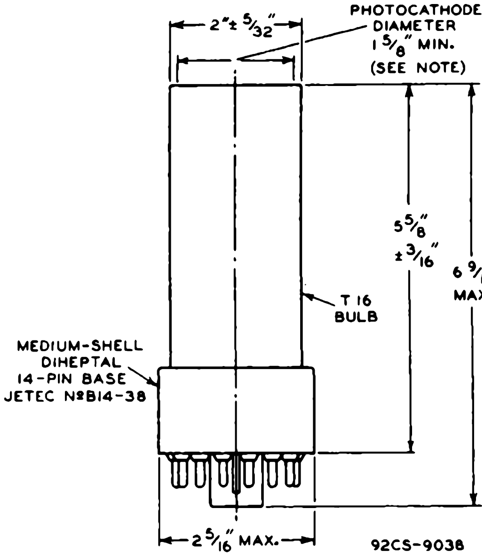
MULTIPLIER PHOTOTUBE

The use of an average anode current well below the maximum rated value of 0.75 milliampere is recommended when stability of operation is important. When maximum stability is required, the anode current should not exceed 100 microamperes.

Electrostatic and/or *magnetic shielding* of the 6903 may be necessary.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-13 Response is shown at the front of this Section



92CS-9038

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

NOTE: WITHIN MINIMUM DIAMETER, DEVIATION FROM FLATNESS WILL NOT EXCEED 0.010" FROM PEAK TO VALLEY.

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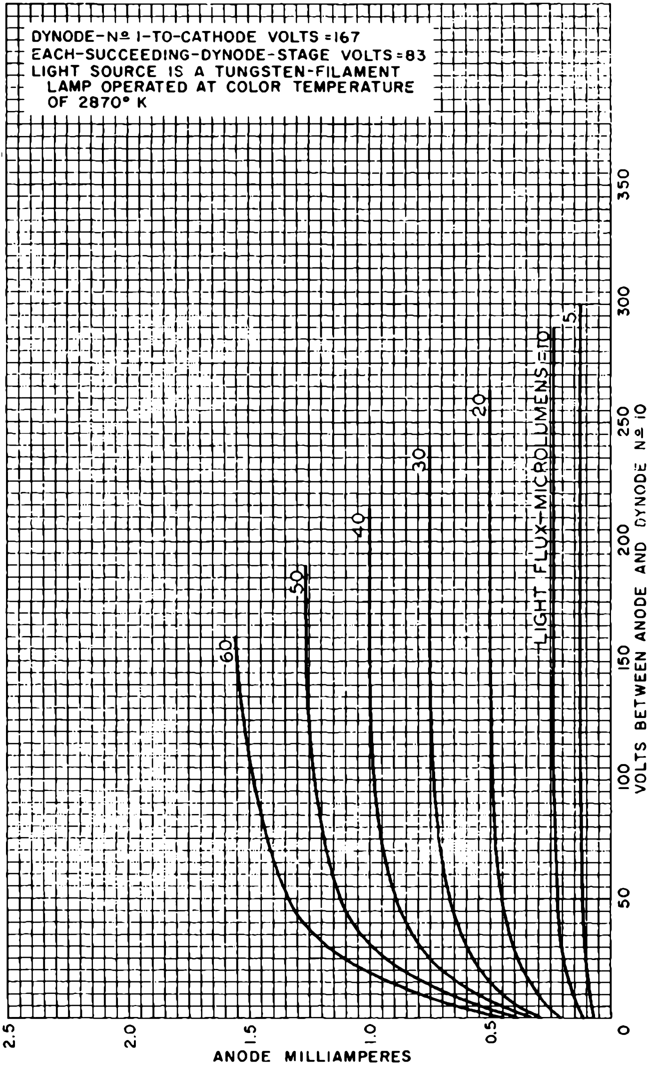
AVERAGE ANODE CHARACTERISTICS



TUBE DIVISION 92CM-9039

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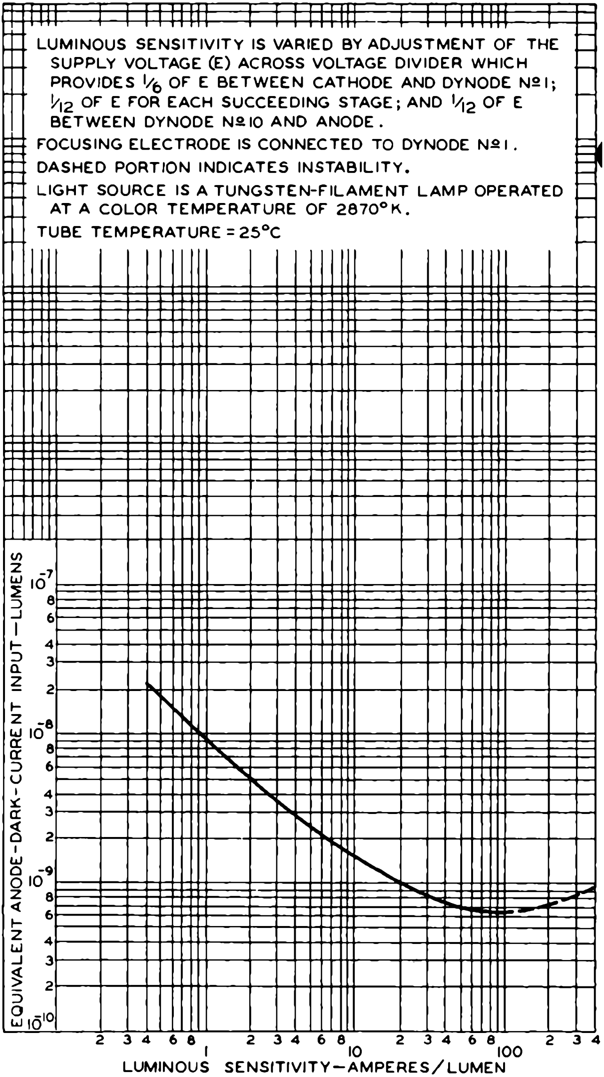
TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



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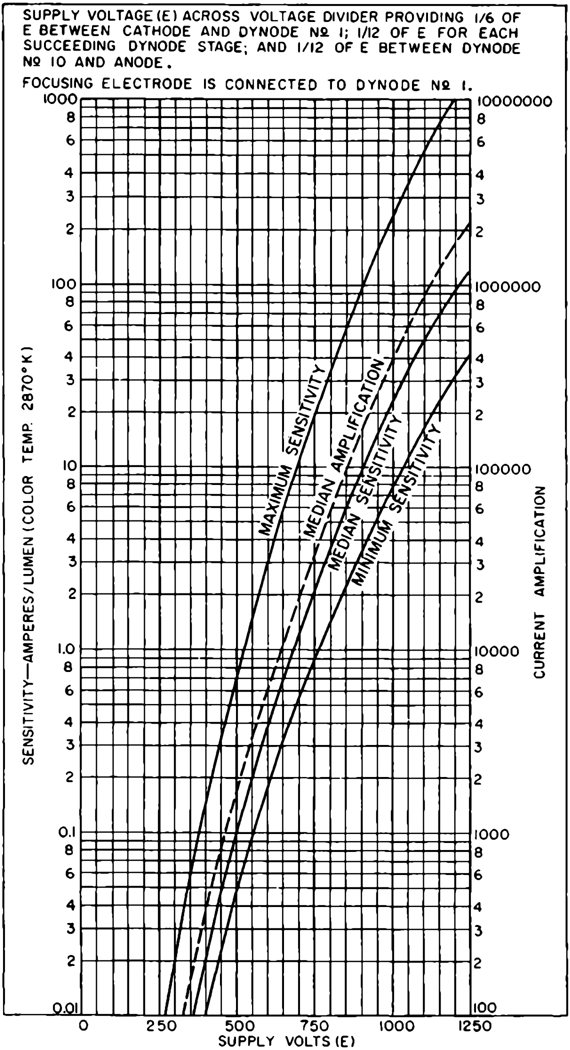
CHARACTERISTICS



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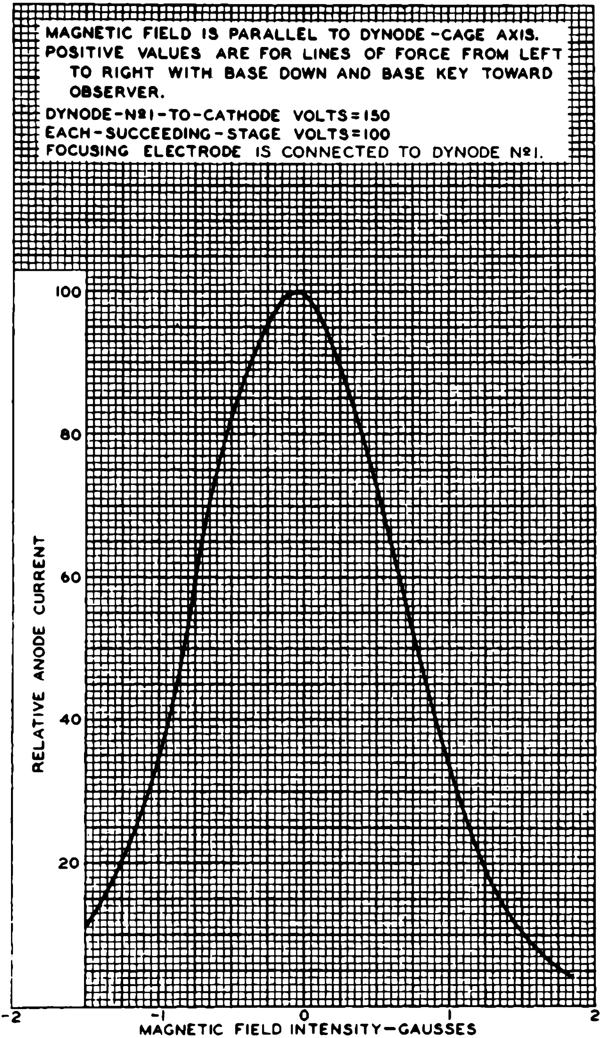
EFFECT OF MAGNETIC FIELD ON ANODE CURRENT



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7038
VIDICON

600-LINE RESOLUTION

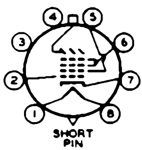
For film and live pickup
with color or black-and-white TV cameras

DATA

General:

Heater, for Unipotential Cathode:
  Voltage. . . . . 6.3 ± 10% . . . ac or dc volts
  Current. . . . . 0.6 . . . . .amp
Direct Interelectrode Capacitance:♣
  Target to all
  other electrodes . . . . 4.6 μμf
Spectral Response. . . . . *See Curves*
Photoconductive Layer:
  Maximum useful diagonal of rectangular
  image (4 x 3 aspect ratio) . . . . 0.62"
  Orientation of quality rectangle—Proper orientation is obtained when the horizontal scan is essentially parallel to the straight sides of the masked portions of the faceplate. The straight sides are parallel to the plane passing through the tube axis and short index pin. The masking is for orientation only and does not define the proper scanned area of the photoconductive layer.
Focusing Method. Magnetic
Deflection Method. . . . . Magnetic
Overall Length . . . . 6.25" ± 0.25"
Greatest Diameter. . . . . 1.125" ± 0.010"
Weight (Approx.) . . . . 2 oz
Operating Position .Any ◄—
Bulb T8
Base Connector . . . . Cinch No.54A18088, or equivalent
Base . . . . . . Small-Button Ditetrar 8-Pin (JEDEC No.E8-11)
  Basing Designation for BOTTOM VIEW 8HM

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Internal Connection— Do Not Use
Pin 4 - Same as Pin 3
Pin 5 - Grid No.2
Pin 6 - Grid No.4, Grid No.3



DIRECTION OF LIGHT: INTO FACE END OF TUBE

Pin 7 - Cathode
Pin 8 - Heater
Flange - Target
Short Index Pin - Same as Pin 3

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

For scanned area of 1/2" x 3/8"

GRID-No.3 & GRID-No.4 VOLTAGE. . . . . . . 350 max. volts
GRID-No.2 VOLTAGE. . . . . 350 max. volts
GRID-No.1 VOLTAGE:
  Negative-bias value. . . . . 125 max. volts
  Positive-bias value. . . . . 0 max. volts

♣: See next page. ◄—Indicates a change.

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PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	10 max.	volts
DARK CURRENT	0.25 max.	μa
PEAK TARGET CURRENT.	0.55 max.	μa
FACEPLATE:		
Illumination	1000 max.	ft-c
Temperature.	60 max.	°C

Typical Operation:

For scanned area of 1/2" x 3/8" and faceplate temperature of 30° to 35° C

Grid-No.4 (Decelerator) & Grid-No.3 (Beam-Focus Electrode*) Voltage. .	250□ to 300	volts
Grid-No.2 (Accelerator) Voltage. . .	300	volts
Grid-No.1 Voltage for picture cutoff●.	-45 to -100	volts
Average "Gamma" of Transfer Characteristic for signal-output current between 0.02 μa and 0.2 μa	0.65	
Visual Equivalent Signal-to-Noise Ratio (Approx.)○	300:1	
Minimum Peak-to-Peak Blanking Voltage:		
When applied to grid No.1.	75	volts
When applied to cathode.	20	volts
Field Strength at Center of Focusing Coil (Approx.)	40	gausses
Field Strength of Adjustable Alignment Coil⊕.	0 to 4	gausses

Maximum-Sensitivity Operation for Live-Scene Pickup

Faceplate Illumination (Highlight) .	2	ft-c
Maximum Target Voltage required to produce dark current of 0.2 μa in any tube**.	110	volts
Target Voltage†.	60 to 100	volts
Dark Current▲.	0.2	μa
Target Current (Highlight)■.	0.4 to 0.5	μa
Signal-Output Current:#		
Peak	0.2 to 0.3	μa
Average.	0.08 to 0.1	μa

Average-Sensitivity Operation for Live-Scene Pickup

Faceplate Illumination (Highlight) .	15	ft-c
Maximum Target Voltage required to produce dark current of 0.02 μa in any tube**.	60	volts
Target Voltage†.	30 to 50	volts
Dark Current	0.02	μa
Target Current (Highlight)■.	0.3 to 0.4	μa

♦,*,□,●,○,⊕,**,†,▲,■,#: see next page.

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VIDICON

Signal-Output Current:#		
Peak.	0.3 to 0.4	μa
Average	0.1 to 0.2	μa

Minimum-Lag Operation for Film Pickup

Faceplate Illumination (Highlight).	100	ft-c
Maximum Target Voltage required to produce dark current of 0.004 μa in any tube**	30	volts
Target Voltage†	15 to 25	volts
Dark Current.	0.004	μa
Target Current (Highlight)■	0.3 to 0.4	μa
Signal-Output Current:#		
Peak.	0.3 to 0.4	μa
Average	0.1 to 0.2	μa

♦ This capacitance, which effectively is the output impedance of the 7038, is increased when the tube is mounted in the deflecting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 megohms.

* Beam focus is obtained by combined effect of grid-No.3 voltage which should be adjustable over indicated range, and a focusing coil having an average field strength of 40 gausses.

□ Definition, focus uniformity, and picture quality decrease with decreasing grid-No.4 and grid-No.3 voltage. In general, grid No.4 and grid No.3 should be operated above 250 volts.

● With no blanking voltage on grid No.1.

○ Measured with high-gain, low-noise, cascode-input-type amplifier having bandwidth of 5 Mc. Because the noise in such a system is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of highlight video-signal current to rms noise current, multiplied by a factor of 3.

● The alignment coil should be located on the tube so that its center is at a distance of 3-11/16 inches from the face of the tube, and be positioned so that its axis is coincident with the axis of the tube, the deflecting yoke, and the focusing coil.

** The target voltage for each 7038 must be adjusted to that value which gives the desired operating dark current.

† Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.

▲ The deflecting circuits must provide extremely linear scanning for good black-level reproduction. Dark-current signal is proportional to the scanning velocity. Any change in scanning velocity produces a black-level error in direct proportion to the change in scanning velocity.

■ Video amplifiers must be designed properly to handle target currents of this magnitude to avoid amplifier overload or picture distortion.

\# Defined as the component of the target current after the dark-current component has been subtracted.

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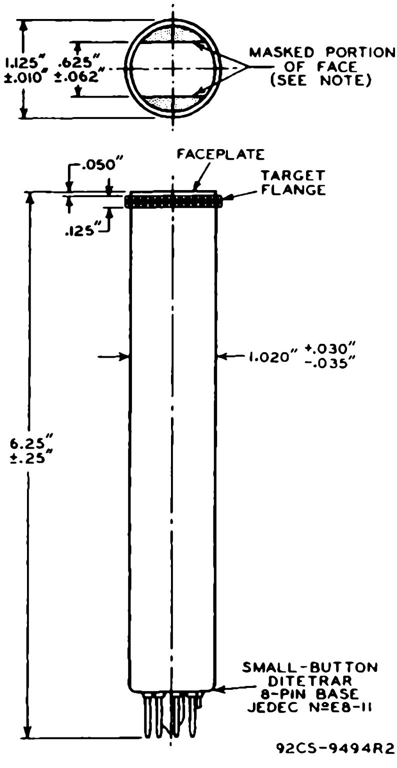
VIDICON



NOTE: STRAIGHT SIDES OF MASKED PORTIONS ARE PARALLEL TO THE PLANE PASSING THROUGH TUBE AXIS AND SHORT INDEX PIN.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7263
VIDICON

LOW-POWER (0.6-WATT) HEATER   600-LINE RESOLUTION

For use under severe shock and vibration, high humidity, and altitudes up to 50,000 feet in small, compact, transistorized TV cameras

DATA

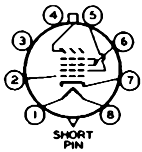
General:

Heater, for Unipotential Cathode:		
Voltage	6.3 ± 10%	. . . ac or dc volts
Current	0.095	. . . . amp
Direct Interelectrode Capacitance:♦		
Target to all other electrodes	4.6	$\mu\mu$f
Spectral Response		*See Curves*
Photoconductive Layer:		
Maximum useful diagonal of rectangular image (4 x 3 aspect ratio)		0.62"

Orientation of quality rectangle—Proper orientation is obtained when the horizontal scan is essentially parallel to the plane passing through the tube axis and short index pin.

Focusing Method	Magnetic
Deflection Method	Magnetic
Overall Length	5.12" ± 0.06"
Greatest Diameter	1.125" ± 0.010"
Weight (Approx.)	2 oz
Operating Position	Any
Bulb	T8
Base Connector	Cinch No.54A18088, or equivalent
Base	Small-Button Ditetrar 8-Pin (JEDEC No.E8-11)
Basing Designation for BOTTOM VIEW	8HM

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Internal Connection— Do Not Use
Pin 4 - Same as Pin 3
Pin 5 - Grid No.2
Pin 6 - Grid No.4, Grid No.3



DIRECTION OF LIGHT: INTO FACE END OF TUBE

Pin 7 - Cathode
Pin 8 - Heater
Flange - Target
Short Index Pin - Same as Pin 3

Maximum Ratings, *Absolute-Maximum Values:*

For altitudes up to 50,000 feet and scanned area of 1/2" x 3/8"

GRID-No.3 & GRID-No.4 VOLTAGE	350 max.	volts
GRID-No.2 VOLTAGE	350 max.	volts
GRID-No.1 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 . .	10 max.	volts

♦: See next page.

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VIDICON

DARK CURRENT.	0.25 max.	μa
PEAK TARGET CURRENT	0.55 max.	μa
FACEPLATE:		
Illumination.	1000 max.	ft-c
Temperature (Operating or storage). . .	60 max.	°C

Typical Operation:

For scanned area of 1/2" x 3/8" and faceplate temperature of 30° to 35° C

Grid-No.4 (Decelerator) & Grid-No.3 (Beam-Focus-Electrode*) Voltage	250□ to 300	volts
Grid-No.2 (Accelerator) Voltage . . .	300	volts
Grid-No.1 Voltage for picture cutoff●	-45 to -100	volts
Average "Gamma" of Transfer Characteristic for signal-output current between 0.02 μa and 0.2 μa.	0.65	
Visual Equivalent Signal-to-Noise Ratio (Approx.)○.	300:1	
Minimum Peak-to-Peak Blanking Voltage:		
When applied to grid No.1	75	volts
When applied to cathode	20	volts
Field Strength at Center of Focusing Coil (Approx.)	40	gausses
Field Strength of Adjustable Alignment Coil⊕	0 to 4	gausses

Maximum-Sensitivity Operation for Live-Scene Pickup

Faceplate Illumination (Highlight). .	2	ft-c
Maximum Target Voltage required to produce dark current of 0.2 μa in any tube**	110	volts
Target Voltage†	60 to 100	volts
Dark Current▲	0.2	μa
Target Current (Highlight)■	0.4 to 0.5	μa
Signal-Output Current:#		
Peak.	0.2 to 0.3	μa
Average	0.08 to 0.1	μa

Average-Sensitivity Operation for Live-Scene Pickup

Faceplate Illuminiation (Highlight) .	15	ft-c
Maximum Target Voltage required to produce dark current of 0.02 μa in any tube**	60	volts
Target Voltage†	30 to 50	volts
Dark Current.	0.02	μa
Target Current (Highlight)■	0.3 to 0.4	μa

♦, *, □, ●, ○, ⊕, **, †, ▲, ■, #: See next page.

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VIDICON

Signal-Output Current:#		
Peak.	0.3 to 0.4	μa
Average	0.1 to 0.2	μa

Minimum-Lag Operation for Film Pickup

Faceplate Illumination (Highlight).	100	ft-c
Maximum Target Voltage required to produce dark current of 0.004 μa in any tube**	30	volts
Target Voltage†	15 to 25	volts
Dark Current.	0.004	μa
Target Current (Highlight)■	0.3 to 0.4	μa
Signal-Output Current:#		
Peak.	0.3 to 0.4	μa
Average	0.1 to 0.2	μa

♁ This capacitance, which effectively is the output impedance of the 7263, is increased when the tube is mounted in the deflecting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 megohms.

* Beam focus is obtained by combined effect of grid-No.3 voltage which should be adjustable over indicated range, and a focusing coil having an average field strength of 40 gausses.

□ Definition, focus uniformity, and picture quality decrease with decreasing grid-No.4 and grid-No.3 voltage. In general, grid No.4 and grid No.3 should be operated above 250 volts.

● With no blanking voltage on grid No.1.

○ Measured with high-gain, low-noise, cascode-input-type amplifier having bandwidth of 5 Mc. Because the noise in such a system is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of highlight video-signal current to rms noise current, multiplied by a factor of 3.

⊕ The alignment coil should be located on the tube so that its center is at a distance of 3-11/16 inches from the face of the tube, and be positioned so that its axis is coincident with the axis of the tube, the deflecting yoke, and the focusing coil.

** The target voltage for each 7263 must be adjusted to that value which gives the desired operating dark current.

† Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.

▲ The deflecting circuits must provide extremely linear scanning for good black-level reproduction. Dark-current signal is proportional to the scanning velocity. Any change in scanning velocity produces a black-level error in direct proportion to the change in scanning velocity.

■ Video amplifiers must be designed properly to handle target currents of this magnitude to avoid amplifier overload or picture distortion.

\# Defined as the component of the target current after the dark-current component has been subtracted.

SPECIAL PERFORMANCE DATA

In connection with the following tests, sample 7263's will maintain resolution as determined with a RETMA Resolution Chart, or equivalent, and will faithfully reproduce all resolution wedges and grey scales of the chart.

Vibration Tests:

These tests are performed under conditions for *Average-Sensitivity Operation for Live-Scene Pickup* on a sample lot

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VIDICON

of tubes from each production run. Tubes and their associated components§ are vibrated on apparatus providing dynamic conditions similar to those described in MIL-E-5272B♦, paragraph 4.7.1.

Resonance. Tubes and associated components§ are vibrated (per the method of MIL-E-5272B♦, paragraph 4.7.1.1) for 1 hour at +25° C, for 15 minutes at 0° C, and for 15 minutes at +55° C.

Cycling. Tubes and associated components§ are vibrated (per the method of MIL-E-5272B♦, paragraph 4.7.1.2 pertaining to specimen without vibration isolators) for 1 hour at +25° C, for 15 minutes at 0° C, and for 15 minutes at +55° C.

Temperature-Pressure (Altitude) Tests:

Tubes and associated components§ are subjected (per the method of MIL-E-5400♣ paragraph 3.2.20, 3.2.20.1, and 3.2.20.1.1) to the separate and combined effects of varying temperature 0° to +55° C and varying barometric pressure 30 to 3.4 inches of mercury. The pressures correspond to sea level and to an altitude of 50,000 feet, respectively.

Shock Tests:

These tests are performed with no voltages applied and on a sample lot of tubes from each production run. Tubes and their associated components§ are subjected in these tests (per MIL-E-5400♣, paragraph 3.2.21.2.1) to 18 impact shocks of 15 g consisting of 3 shocks in opposite directions along each of three mutually perpendicular axes of the tube. Each shock impulse has a duration of 11 ± 1 milliseconds with a maximum impact acceleration occurring at approximately 5.5 milliseconds.

Temperature-Humidity Tests:

These tests are performed with no voltages applied to the 7263. The 7263 and associated components§ are subjected (per the method of MIL-E-5400♣, paragraph 3.2.20.2B) to relative humidities up to and including 100 per cent at temperatures up to and including +50° C.

§ Tube socket such as Cinch No.54A18088 and RCA Assembly No.200SDU501, or equivalent, which consists of the deflecting coils, focusing coil, alignment coil, shield, and target connector.

♦ 5 June 1957, Procedure I of Military Specification.

♣ 1 January 1956.

OPERATING CONSIDERATIONS

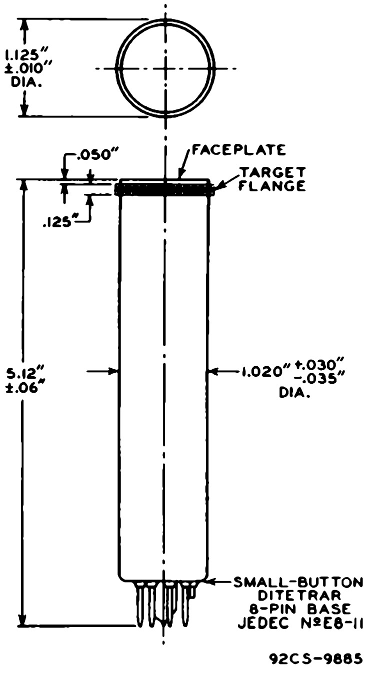
The *target connection* is made by a suitable spring contact bearing against the edge of the target flange. This spring contact may conveniently be provided as part of the focusing-coil design.

Support for the 7263 should be provided such that, under vibration and shock, the tube will not be displaced with respect

7263

VIDICON

to the focusing, deflecting, and alignment fields. Suitable support is provided for the tube and its socket in the RCA Deflection Assembly 200SDU501, or equivalent. Orientation of the 7263 in its support should be such that the horizontal scan is essentially parallel to the plane passing through the tube axis and short index pin.



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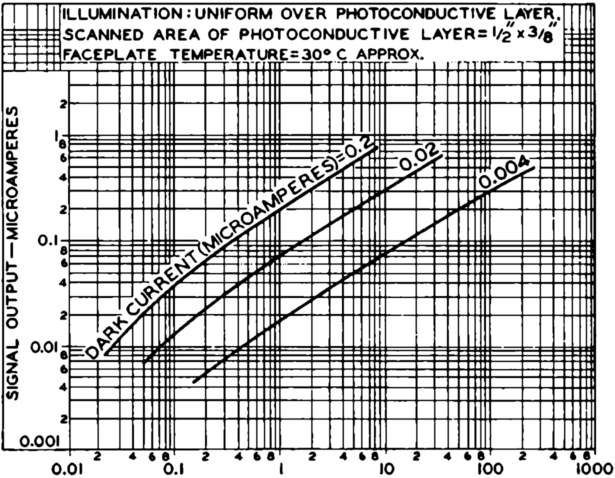
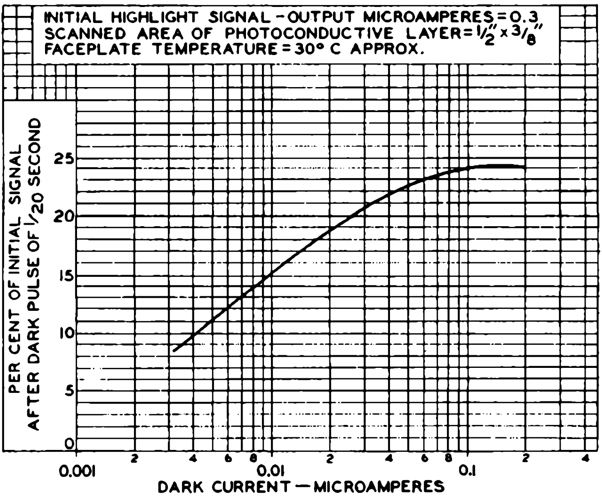
TYPICAL LIGHT-TRANSFER CHARACTERISTICS



92CS-9495

TYPICAL PERSISTENCE CHARACTERISTIC



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RCA

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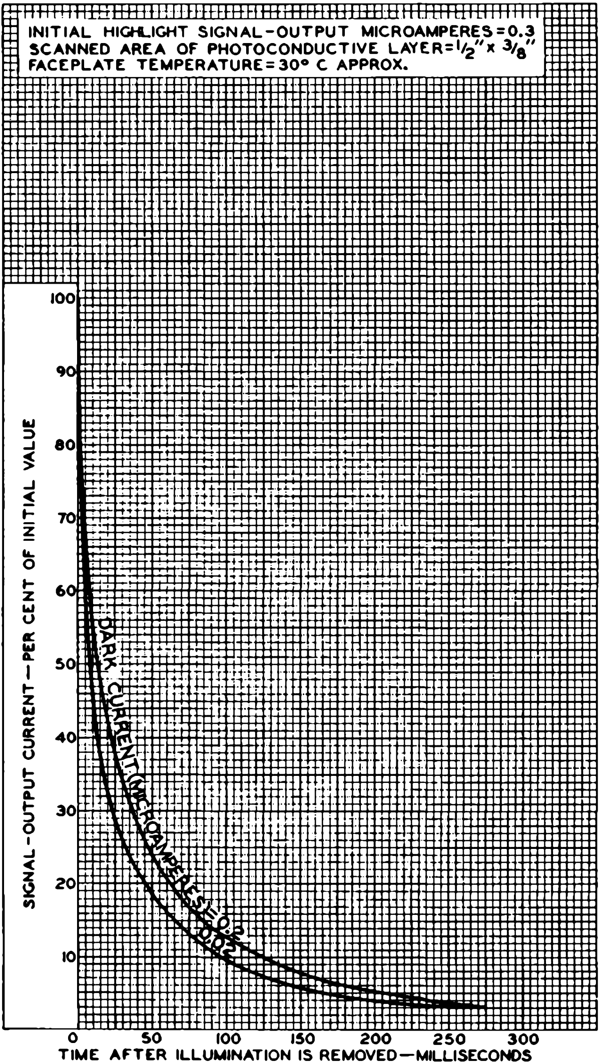
TYPICAL PERSISTENCE CHARACTERISTICS



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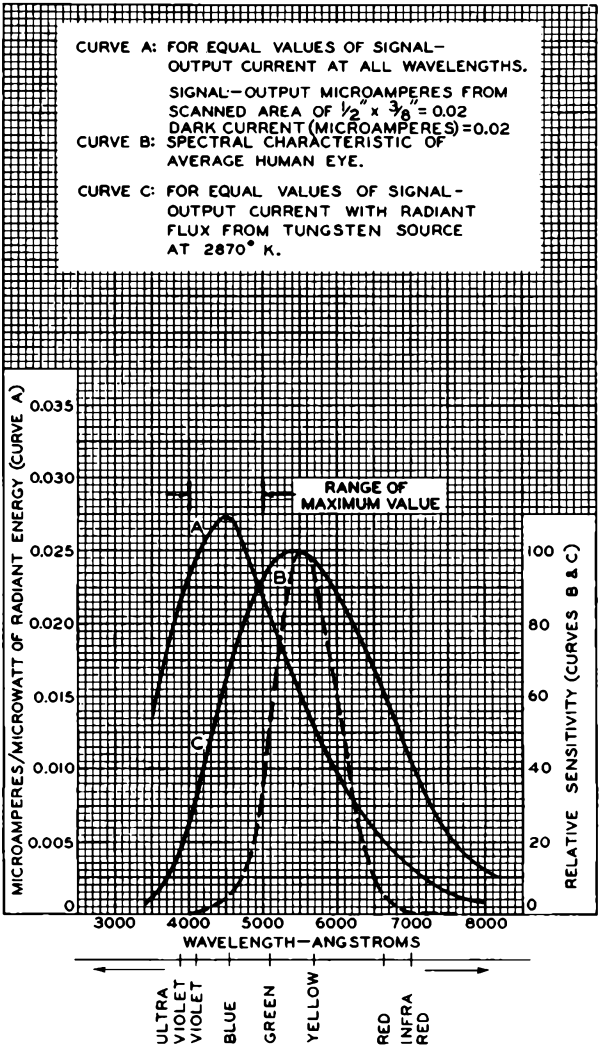
SPECTRAL-SENSITIVITY CHARACTERISTICS



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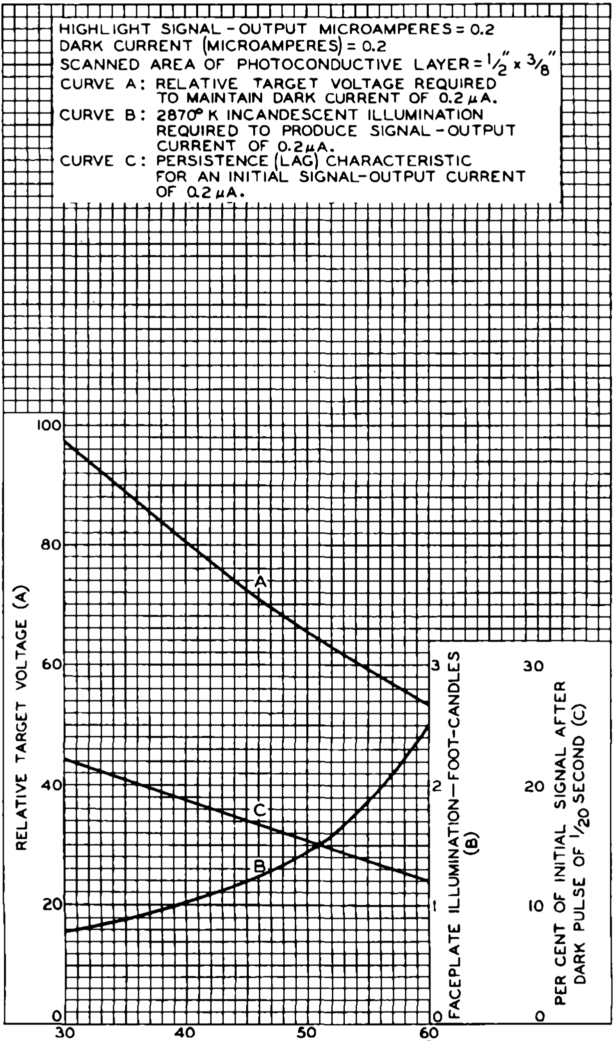
7263

TYPICAL CHARACTERISTICS



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RCA

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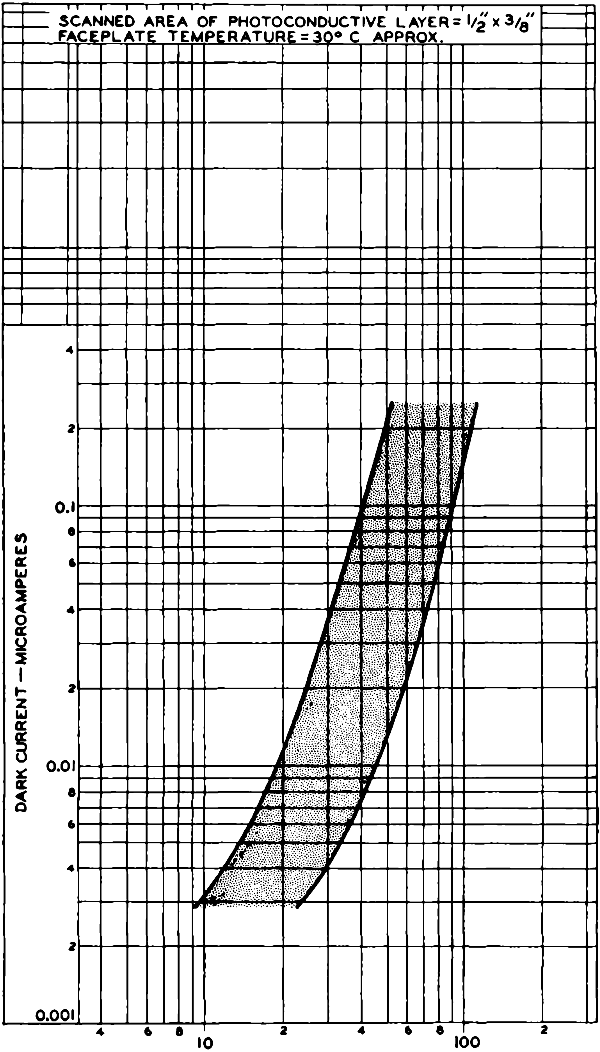
DARK-CURRENT RANGE



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TYPICAL CHARACTERISTIC