RCA TUBE
HANDBOOK
HB-3

GENERAL SECTION

The information in this Section, in general, applies to all classes of RCA tubes. It includes such material as the Table of Contents for all Sections; Index of Tube Types arranged in numerical-alphabetical-numerical sequence; list of preferred types; list of not-recommended types; interchangeability list; discussion of ratings; outlines; cap and base drawings; as well as other general information of interest to the equipment designer.

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

This Handbook of data on RCA electron tubes has been compiled to meet the requirements of electronic-equipment design engineers primarily but will prove helpful to anyone having need for technical information which can be kept up to date. Its convenient loose-leaf form permits the revision of data on existing types and the addition of data on new types as they are made available. The material is arranged in Sections divided by tabbed separators to facilitate quick reference.

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Table of Contents

Sheets in the RCA Electron Tube Handbook are arranged in the Table of Contents in order of appearance in each section. The Index of Types, which follows the Table of Contents, lists type numbers in numerical-alphabetical-numerical sequence.

The Table of Contents and Index of Types may be used to determine:

(1) location of individual 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 (e.g., 4-71).

GENERAL SECTION

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GENERAL SECTION (Cont'd)

CATHODE-RAY TUBE, STORAGE TUBE, & MONOSCOPE SECTION

▲ Persistence Characteristic, shown on back of Spectral-Energy Emission Curve.

CATHODE-RAY TUBE, STORAGE TUBE, & MONOSCOPE SECTION (Cont'd)

▲ Persistence Characteristic, shown on back of Spectral-Energy Emission Curve.

CATHODE-RAY TUBE, STORAGE TUBE, & MONOSCOPE SECTION (Cont'd)

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

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PHOTOSENSITIVE DEVICE SECTION (Cont'd)

PHOTOSENSITIVE DEVICE SECTION (Cont'd)

For types in Photosensitive Device Section, see types with letter "P" in "Section" column of INDEX OF TYPES starting on back of sheet INDEX OF TYPES 1.

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For types in Receiving-Type Industrial Tube Section, see types with letter "D" in "Section" column of INDEX OF TYPES starting on back of sheet INDEX OF TYPES 1.

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For types in Transmitting Tube Section, see types with letter "T" in "Section" column of INDEX OF TYPES starting on sheet INDEX OF TYPES 2.

ADDITIONS AND REVISIONS

GENERAL SECTION

CATHODE-RAY TUBE, STORAGE TUBE, & MONOSCOPE SECTION

RECEIVING TUBE SECTION – PART 1

DELETION

RECEIVING TUBE SECTION – PART 1

Index of Types

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

C = Cathode-Ray Tube, Storage Tube & Monoscope
D = Receiving- Type Industrial Tube
F = Thyratron, Ignitron, & Glow-Discharge Tube
G = General
P = Photosensitive Device
R = Receiving Tube
T = Transmitting Tube

Supplements, when applicable, will appear immediately following this index.

▲ See sheet titled *RCA RECEIVING TUBE TYPES – Supplementary Listing* at beginning of Receiving Tube Section.

□ See sheet titled *RCA RECEIVING TUBE DATA – Types Not Recommended for New Equipment Design* at beginning of Receiving Tube Section.

* See sheet titled *RCA TRANSMITTING-TUBE TYPES – Limited Listing* at beginning of Transmitting Tube Section.

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

Reference is to front of sheet only unless otherwise indicated. Data appearing on sheet is identified by month and year only (e. g., 4-71).

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For key to symbols, see sheet Index of Types 1

Index of Types 2AH2 to 3B2

For key to symbols, see sheet Index of Types 1

Type	Section	Sheet & Date
2AH2 . . .	R	Data, 1-63
2AP1A . .	C	Data 1&2, 7-45
2AS2• . .	R	Data, 3-64
2AS2A . .	R	Suppl. Listing, 4-71▲
2AV2 . . .	R	Data, 9-65
2BJ2	R	Data, 9-65
2BN4A . .	R	Suppl. Listing, 4-71▲
2BP1 . . .	C	Data, 9-50
	C	Circuit CE-6777R1
	C	Curve 92CM-6748R1
2BP11 . .	C	Data, 9-50
2BU2 . . .	R	Data 1&2, 11-70 Use 2BU2/2AH2
2C39A .	T	Data Chart, 11-69*
2C39WA .	T	Data Chart, 11-69*
2C40• . .	T	Data Chart, 11-69*
2C43 . . .	T	Data Chart, 11-69*
2CN3A . .	R	Data, 11-70
2CW4 . . .	R	On 2CN3A sheet
2CY5 . . .	R	On 2CN3A sheet
2D21 . . .	F	Data, 6-48
	F	Curve CE-6534T2
	F	Curve 92CM-6531R1
2DS4 . . .	R	On back of 2CN3A sheet
2DV4 . . .	R	On back of 2CN3A sheet
2E24 . . .	T	Data Chart, 11-69*
2E26 . . .	T	Data Chart, 11-69*
2EG4 . . .	R	Suppl. Listing, 4-71▲
2EN5 . . .	R	Data Chart, 2-70□
2ER5 . . .	R	Data, 12-65

Type	Section	Sheet & Date
2F21 . . .	C	Tent. Data, 6-46
	C	Outline & Notes CE-6653
2FH5 . . .	R	On 2ER5 sheet
2FS5 . . .	R	On 2ER5 sheet
2GK5 . . .	R	On 2ER5 sheet Use 2GK5/2FQ5A
2GU5 . . .	R	On back of 2ER5 sheet
2HQ5 . . .	R	Suppl. Listing, 4-71▲
2K26 . . .	T	Tent. Data 1&2, 11-48
	T	Outline & Notes CE-6986VB
	T	Coupling Arrangement CE7008VB
	T	Curve CE-7003T
2X2A . . .	T	Data, 9-55
3A2	R	Data Chart, 2-70□
3A3A•	R	Data, 6-66 Use 3A3B
3A3C . . .	R	Suppl. Listing, 4-71▲
3A4	D	Data, 12-44
	D	Curve 92C-6370
3A5	D	Tent. Data, 6-42
	D	Curve 92C-6376
3AF4A• .	R	Data, 6-64 Use 3AF4A/3DZ4
3AL5 . . .	R	On 3AF4A sheet
3AP1A .	C	Data, 6-46
3AQP1 . .	C	Data, 10-60
3AT2 . . .	R	Data, 6-64
3AT2B . .	R	Suppl. Listing, 4-71▲
3AU6 . . .	R	Data, 11-70
3AV6 . . .	R	On 3AU6 sheet
3AW2A .	R	Suppl. Listing, 4-71▲
3B2• . . .	R	Data Chart, 2-70□

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For key to symbols, see sheet Index of Types 1

Type	Section	Sheet & Date
3B28 ...	T	Tent. Data 1&2, 2-52
3BA6 ...	R	On 3AU6 sheet
3BC5/ 3CE5 ...	R	Suppl. Listing, 4-71▲
3BN2A ..	R	Suppl. Listing, 4-71▲
3BN4A ..	R	On 3AU6 sheet
3BN6 ...	R	On back of 3AU6 sheet
3BP1A ..	C	Data 1&2, 7-45
	C	Curve 92CM-6412R1
3BU8/ 3GS8 ...	R	On back of 3AU6 sheet
3BW2 ...	R	Data 1&2,11-70
3BW2/ 3BS2A/ 3BT2 ..	R	Suppl. Listing, 4-71▲
3BY6.	R	Data, 11-70
3BZ6 ...	R	On 3BY6 sheet
3C23 ...	F	Data, 4-56
	F	Curve CE-6703T2
3C33 ...	T	Data Chart, 11-69 •
3C45 ...		See 6130/3C45
3CA3 ...	R	Suppl. Listing, 4-71▲
3CB6/ 3CF6 ...	R	On 3BY6 sheet
3CN3A .	R	Data, 9-68
3CN3B ..	R	Suppl. Data, 4-71▲
3CS6 ...	R	Data, 9-68
3CU3A ..	R	Data 1&2, 11-70
3CX3 ...	R	Suppl. Listing, 4-71▲
3CY5 ...	R	Data, 9-68
3CZ3• ..	R	Data, 9-68
3D22A ..	F	Data 1 to 3, 7-55
	F	Curve CE-6483T3
	F	Curves CE-6865T1-6830T
3DB3 ...	R	Data 1&2, 11-70
3DB3/ 3CY3 ...	R	Suppl. Listing, 4-71▲
3DC3 ...	R	Suppl. Listing, 4-71▲
3DF3 ...	R	Data 1&2, 11-70
3DG3 ...	R	Data 1&3, 5-61
3DJ3 ...	R	Data 1&2, 11-70
3DK6 ...	R	Data, 2-64
3DT6A ..	R	On 3DK6 sheet
3DZ4 ...	R	On back of 3DK6 sheet Use 3AF4A/ 3DZ4
3E29 ...	T	Data Chart, 11-69 •
3EA5• ..	R	On back of 3DK6 sheet
3EH7• ..	R	On back of 3DK6 sheet Use 3EH7/ XF183
3EJ7• ...	R	Data, 2-64 Use 3EJ7/ XF184
3ER5, 3FH5 ...	R	On 3EJ7 sheet
3FS5, 3GK5 ..	R	On back of 3EJ7 sheet
3GS8• ..	R	Data, 10-66 Use 3BU8/ 3GS8
3HM5/ 3HA5 ..	R	On 3GS8 sheet
3HQ5 ...	R	Suppl. Listing, 4-71▲
3HS8 ...	R	On 3GS8 sheet
3JC6• ...	R	On back of 3GS8 sheet
3JC6A, 3JD6• ..	R	On back of 3GS8 sheet
3JP1	C	Data 1&2, 8-51
	C	Curve 92CM-7671

For key to symbols, see sheet Index of Types 1

Index of Types
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For key to symbols, see sheet Index of Types 1

Type	Section	Sheet & Date
4ES8• . . .		Use 4ES8/ XCC189
4EW6 . . .	R	On back of 4EH7 sheet
4GK5 . . .	R	Suppl. Listing, 4-71▲
4GM6 . . .	R	On back of 4EH7 sheet
4HM6 . . .	R	Data, 8-63
4HQ5 . . .	R	Suppl. Listing, 4-71▲
4HS8 . . .	R	Data, 3-64
4JC6• . . .	R	Data, 10-66
4JC6A . .	R	On 4JC6 sheet
4JD6 . . .	R	On 4JC6 sheet
4JH6 . . .	R	Suppl. Listing, 4-71▲
4KE8 . . .	R	On 4JC6 sheet
4KT6 . . .	R	On 4JC6 sheet
4X150D .		See 7035/4X150D
4X500A .	T	Data Chart, 11-69*
5-125B . .		See 4E27A/ 5-125B
5ABP1 . .	C	Tent. Data 1&2, 6-53
	C	Outline CE-7842
	C	Curve 92CM-7910
5ABP4• .	C	Data, 11-55
5ABP7• .	C	On 5ABP4 sheet
5ABP11 .	C	On 5ABP4 sheet
5ADP1 . .	C	Tent. Data 1&2, 12-56
	C	Curve 92CM-9099
	C	Curve 92CM-6820R1
5AM8 . . .	R	On back of 4JC6 sheet
5AN8 . . .	R	On back of 4JC6 sheet
5AQ5 . . .	R	On back of 4JC6 sheet
5AS4A. . .	R	Tent. Data, 4-57
5AS8 . . .	R	Data, 7-61
5AT8 . . .	R	On 5AS8 sheet
5AUP24 .	C	Data 1&2, 9-58
	C	Curve 92CM-8343R1
5AV8 . . .	R	Data, 7-61
5AZ4 . . .	R	Data Chart, 2-70□
5AZP4 . .		Data 1 to 6, 2-69
5B8	R	Tent. Data 1&2, 9-58
5BC3A . .	R	Data 1 to 4, 4-65
5BE8 . .	R	Data Chart, 2-70□
5BK7A .	R	Data, 2-59
5BP1A . .	C	Data 1, 7-45
5BQ7A . .	R	On 5BK7A sheet
5BR8 . . .	R	On 5BK7A sheet Use 5BR8/5FV8
5BT8 . . .	R	Data Chart, 2-70□
5BW8 . . .	R	Data, 7-61
5C21 . . .		See C6J/5C21
5CG8 . . .	R	Data, 7-61
5CL8A . .	R	On 5CG8 sheet
5CM8• . .	R	On 5CG8 sheet
5CP1A . .	C	Data 1&2, 10-51
	C	Outline CE-6408R4
	C	Curve 92CM-6821
5CP11A .	C	Tent. Data, 4-47
5CQ8 . . .	R	On back of 5CG8 sheet
5CZ5 . . .	R	On back of 5CG8 sheet
5D22 . . .		See 4-250A/5D22
5DJ4 . . .	R	Data Chart, 2-70□
5EA8 . . .	R	Data, 5-62
5EU8 . . .	R	On 5EA8 sheet
5EW6 . . .	R	On 5EA8 sheet
5FG7 . . .	R	On back of 5EA8 sheet
5FP4A . .	C	Data 1&2, 8-63
5FP7A . .	C	Data, 8-51
5FV8 . . .	R	On back of 5EA8 sheet
5GH8A . .	R	Data, 9-68
5GM6 . . .	R	On 5GH8A sheet
5GX6 . . .	R	On 5GH8A sheet
5HZ6 . . .	R	On back of 5GH8A sheet

For key to symbols, see sheet Index of Types 1

Type	Section	Sheet & Date
5J6	R	On back of 5GH8A sheet
5KE8	R	On back of 5GH8A sheet
5MQ8	R	On back of 5GH8A sheet
5R4GYB	D	Data 1 to 4, 7-61
5T8	R	Data, 4-56
5U4G	R	Data Chart, 2-70□
5U4GB	R	Data 1 to 3, 7-61
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	Data, 9-65
5UP11	C	On 5UP7 sheet
5UP31	C	On 5UP7 sheet
5V3A	R	Data, 7-61 Use 5V3A/5AU4
5V4GA	R	Tent. Data, 7-58
	R	Outline CE-9549R1 & Curve 92CS-6110R1
5V6GT	R	Data, 7-58
5WP11	C	Tent. Data 1&2, 2-49
5X8	R	Data, 3-55
5Y3GT	R	Data 1&2, 7-61
5Y4GA	R	Data Chart, 2-70□
5Y4GT	R	Data Chart, 2-70□
5Z3	R	Data Chart, 2-70□
5Z4	R	Data Chart, 2-70□
5ZP16	C	Data 1&2, 7-58
	C	Outline & Notes CE-7574R2
	C	Curve 92CM-7576R1
6A7	R	Data Chart, 2-70□

Type	Section	Sheet & Date
6A8	R	Data Chart, 2-70□
6AB4	R	Data, 5-52 See also 6664/6AB4
6AC7	R	Data Chart, 2-70□
6AD10		Suppl. Listing, 4-71▲
6AF3	R	Data, 10-59
6AF4	R	Data, 11-54
6AF4A	R	Data, 5-61
	R	Curve 92CM-7756
	R	Curve 92CM-7759R1 Use 6AF4A/6DZ4
6AF6G	R	Data, 12-44
6AF11	R	Data, 5-65
6AG5	R	Data, 1-55
	R	Curve 92CM-6399R2
6AG7	R	Data 1&2, 11-52
	R	Curves CE-6035T1 & CE-6036T1
6AH4GT	R	Data Chart, 2-70□
6AH6	R	Data Chart, 2-70□
6AK5	R	Data, 9-55
	R	Curve 92CM-6504 Use 6AK5/EF95
6AK6	D	Tent. Data 10-43
	D	Curve 92C-6449
6AL3•	R	Data, 3-62 Use 6AL3/EY88
6AL5	R	Data, 5-54
	R	Curve 92CM-6561 See also 6663/6AL5
6AL7GT	R	Data Chart, 2-70□
6AL11	R	Data 1, 10-66
	R	Data 2&3, 8-64
6AM4	R	Data Chart, 2-70□
6AM8A	R	Data 1, 10-59
	R	Curve 92CS-8504R1
	R	Curve 92CM-10244
6AN4	R	Tent. Data, 6-57

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For key to symbols, see sheet Index of Types 1

Type	Section	Sheet & Date
6AN8A . .	R	Data 1 to 3, 1-61
6AQ5A . .	R	Data 1&2, 11-58
		See also 6669/6AQ5A
6AQ6 . . .	R	Data Chart, 2-70□
6AQ7GT	R	Data Chart, 2-70□
6AR5 . . .	R	Data Chart, 2-70□
6AR11 . .	R	Data 1&2, 1-63
6AS5 . . .	R	Data Chart, 2-70□
6AS6 . . .	D	Tent. Data, 2-50
	D	Curve 92CM-7401; -7408
	D	Curve 92CM-7404R1
6AS7G . .	D	Data, 5-55
	D	Curve 92CM-6618
6AS8 . . .	R	Tent. Data, 5-54
	R	Curve 92CM-8206
6AS11 . .	R	Data 1 & 2, 1-63
6AT6 . . .	R	Data, 9-55
	R	Curve 92CM-6610
6AT8A . .	R	Data, 8-60
6AU4GTA	R	Data, 8-59
6AU5GT	R	Data 1, 11-54
	R	Curve 92CM-7355
6AU6A . .	R	Data 1 to 4, 10-60
6AU8A .	R	Data 1 to 3, 1-62
6AV5GA	R	Data Chart, 2-70□
6AV6 . . .	R	Data, 8-59
6AV11 . .	R	Suppl. Listing, 4-71▲
6AW8A	R	Data 1 to 4, 1-62
6AX3 . . .	R	Data, 5-62
6AX4GTB	R	Data, 3-61
6AX5GT	R	Tent. Data 1&2, 2-50
	R	Curve 92CM-7382
6AX8 . . .	R	Data Chart, 2-70□
6AY3B . .	R	Data, 10-64
6AY11 . .	R	Data, 6-64

Type	Section	Sheet & Date
6AZ8 . . .	R	Tent. Data 1&2, 3-55
	R	Curve 92CM-8519
	R	Curve 92CM-8521
	R	Curve 92CM-8523
6B8	R	Data Chart, 2-70□
6B10 . . .	R	Data 1&2, 1-63
6BA3 . . .	R	Data, 4-65
6BA6 . . .	R	Data, 3-61
	R	Curve 92CM-6609
	R	Curve 92CM-6620
		Use 6BA6/EF93
		See also 6660/6BA6
6BA7 . . .	R	Tent. Data, 9-48
	R	Curve 92CM-6982R1
	R	Curve 92CM-6980R2
6BA8A . .	R	Tent. Data 1&2, 6-57
	R	Curve 92CM-9339; -8646
6BA11 . .	R	Data, 6-64
6BC4 . . .	R	Tent. Data, 6-54
	R	Curve 92CM-8241
6BC5 . . .	R	Data, 3-55
		Use 6BC5/6CE5
6BC7 . . .	R	Tent. Data, 3-54
6BC8 . . .	R	Data 1, 10-66
	R	Curve 92CM-8789
	R	Curve 92CM-8788R1
		Use 6BC8/6BZ8
6BD6 . . .	R	Data Chart, 2-70□
6BD11 . .	R	Data, 5-65
6BE3 . . .	R	Data, 4-64
		Use 6BE3/6BZ3

For key to symbols, see sheet Index of Types 1

Type	Section	Sheet & Date
6BE6	R	Data, 5-61
		Curve 92CM-6625; -6601
6BF5	R	Data Chart, 2-70□
6BF6	R	Data Chart, 2-70□
6BF11	R	Data 1, 10-66
		Data 2 to 4, 4-66
6BG6G	R	Data Chart, 2-70□
6BG6GA•	R	Data Chart, 2-70□
6BH3A	R	Data, 10-64
6BH6	R	Data, 9-55
	R	Curve 92CM-6892; -6893
		See also 6661/6BH6
6BH8	R	Data Chart, 2-70□
6BJ3	R	Data, 6-64
6BJ6	R	Data, 9-55
		Curve 92CM-6867; -6870
		See also 6662/6BJ6
6BJ7	R	Data, 10-59
6BJ8	R	Tent. Data 1&2, 7-58
		Curve 92CM-9535
6BK4B	R	Data 1, 9-65
	R	Data 2, 9-67
6BK4C/ 6EL4A	R	Suppl. Listing, 4-71▲
6BK5	R	Data Chart, 2-70□
6BK7B	R	Data, 2-59
	R	Curve 92CM-9764
6BL7GTA	R	Tent. Data, 4-58
	R	Curve 92CM-9526
6BL8•	R	Data, 5-62
		Use 6BL8/ECF80
6BM8/ ECL82	R	Data, 5-65
6BN4A	R	Data, 1-62
	R	Curve 92CM-9941
6BN6	R	Data 1 to 4, 8-60
		Use 6BN6/6KS6
6BN8	R	Data, 8-59
	R	Curve CE-9364T
	R	Curve 92CM-9365
6BQ5	R	Tent. Data, 6-59
	R	Curve 92CM-9903
		Use 6BQ5/EL84
6BQ6GT8 6CU6	R	Data 1&2, 1-62
6BQ7A	R	Data 1&2, 1-62
		Use 6BQ7A/6BZ7/6BS8
6BR8A	R	Data, 2-67
		Use 6BR8A/6FV8A
6BS3A	R	Data, 10-64
6BS8	R	Data Chart, 2-70□
6BU8	R	Data, 1-62
	R	Curve 92CM-9428; -9433
6BV8	R	Data Chart, 2-70□
6BV11	R	Suppl. Listing, 4-71▲
6BW4	R	Data Chart, 2-70□
6BW8	R	Data, 7-61
6BX7GT	R	Data Chart, 2-70□
6BY5GA	R	Data Chart, 2-70□
6BY6	R	Tent. Data, 3-54
	R	Curve 92CM-8140
	R	Curve 92CM-8138
6BY8	R	Tent. Data 1, 9-58
	R	Curve 92CS-9616
6BZ6	R	Data, 8-59
	R	Curve 92CM-8508R2
	R	Curve 92CM-9485R1
6BZ7	R	Data 1&2, 1-62
		Use 6BQ7A/6BZ7/6BS8
6C4	R	Data 1, 11-54
	R	Curve 92C-6378
6C5	R	Data Chart, 2-70□

Index of Types 6C6 to 6DE7

For key to symbols, see sheet Index of Types 1

For key to symbols, see sheet Index of Types 1

Type	Section	Sheet & Date
6DG6GT	R	Tent. Data, 12-56
6DK6 . . .	R	Tent. Data, 4-59
	R	Curve 92CM-9851R1
6DM4A/6DA4 . .	R	Suppl. Listing, 4-71▲
6DN3 . . .	R	Data 1&2, 5-70
6DN6 . . .	R	Data Chart, 2-70□
6DN7 . . .	R	Data, 10-59
	R	Outline CE-10241
6DQ5 . . .	R	Data 1, 7-63
	R	Outline CE-9343
	R	Curve 92CM-9309
6DR7 . . .	R	Tent. Data, 6-59
	R	Data 2, 1-62
	R	Curve 92CM-9913
6DS4 . . .	R	Data 1 to 3, 1-63
6DS5 . . .	R	Data 1&2, 8-69
	R	Curve 92CM-9292
6DT5 . . .	R	Data, 10-59
6DT6A . .	R	Data 1 to 4, 1-61
6DT8 . . .	R	Tent. Data, 8-57
	R	Curve 92CM-9397
6DV4 . . .	R	Data 1 to 3, 1-63
6DW4B .	R	Data, 4-65
6DX8• . .	R	Data, 9-62 Use 6DX8/ECL84
6DZ4 . . .	R	Data 1&2, 4-63
6E5	R	Data, 12-44
6EA5 . . .	R	See 6CY5
6EA7 . . .	R	Data, 7-61 Use 6EM7/6EA7
6EA8 . . .	R	Data, 7-61
	R	Curve 92CM-9866
	R	Curve 92CM-9867
6EB8 . . .	R	Tent. Data 1&2, 6-59
	R	Curve 92CM-9908
	R	Curve 92CM-9905
6EH5 . . .	R	Data Chart, 2-70□
6EH7• . .	R	Data, 3-62 Use 6EH7/EF183
6EJ7• . . .	R	Data, 3-62
6EL4A . .	R	Suppl. Listing, 4-71▲
6EM5 . . .	R	Data 1 to 3, 5-61
6EM7 . . .	R	Data 1 to 3, 5-61
	R	Data 4, 8-60 Use 6EM7/6EA7
6EN4 . . .	R	Data 1 to 4, 2-71
6EQ7 . . .	R	Data 1&2, 8-60
6ER5 . . .	R	Data, 8-60
6ES5 . . .	R	Data, 7-61
6ES8 . . .	R	Data, 5-61 Use 6ES8/ECC189
6EU7 . . .	R	Data 1&2, 8-60
6EU8 . . .	R	Data, 7-61
6EV5 . . .	R	Data, 7-61
6EV7 . . .	R	Data Chart, 2-70□
6EW6 . . .	R	Data, 10-59 Curve 92CM-9965
6EW7 . . .	D	Data 1 to 4, 1-62
6EZ5 . . .	D	Data Chart, 2-70□
6EZ8 . . .	R	Data, 7-61
6F4	R	Tent. Data, 8-44 Curve 92CM-6567
6F5	R	Data Chart, 2-70□
6F6	R	Data Chart, 2-70□
6F6GT . .	R	Data Chart, 2-70□
6F8G . . .	R	Data Chart, 2-70□
6FA7 . . .	R	Data 1&2, 8-60
6FD7 . . .	R	Data 1&2, 9-62
6FE5 . . .	R	Data Chart, 2-70□
6FG7 . . .	R	Data, 3-62
6FH5 . . .	R	Data 1&2, 8-60
6FH8 . . .	R	Data 1&2, 10-59
	R	Curve 92CM-10221
6FJ7	R	Data 1&2, 1-63
6FM7 . . .	R	Data, 5-65
6FM8 . . .	R	Data, 7-61
6FQ5A . .	R	Data, 3-62 Use 6GK5/6FQ5A

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6FQ7●	R	Data 1 to 3, 5-61 Use 6FQ7/6CG7
6FS5	R	Data, 3-62
6FV6	R	Tent. Data, 6-59
	R	Curve 92CM-10058
6FV8A	R	Data, 3-64
6FW5	R	Data, 5-62
6FY7	R	Data, 5-65
6G11	R	Data 1&2, 8-63
6GB5●	R	Data, 2-66 Use 6GB5/EL500
6GC5	R	Data 1, 9-62
	R	Data 2&3, 4-63
6GE5	R	Data, 4-63
6GF7A	R	Data 1 to 3, 10-64
6GH8A	R	Data 1 to 4, 4-63
6GJ5A	R	Data 1&2, 10-64
6GJ7●	R	Data, 12-65 Use 6GJ7/ECF801
6GK5	R	Data 1&2, 5-61 Use 6GK5/6FQ5A
6GK6	R	Data 1 to 3, 7-61
6GL7	R	Data 1&2, 4-63
6GM6	R	Data 1&2, 8-60
6GN8	R	Data 1 to 3, 5-61
6GT5●	R	Data 1 & 2, 6-63
6GT5A	R	Data 1&2, 10-64
6GU5	R	Data, 12-65
6GU7	R	Data 1&2, 4-63
6GV5	R	Data, 4-64
6GW6●	R	Data 1&2, 3-61 Use 6GW6/6DQ6B
6GW8/ECL86	R	Data, 5-65
6GX6	R	Data 1 to 4, 5-61
6GY6	R	Data 1 to 3, 5-61
6GY8	R	Data Chart, 2-70□
6H6, 6H6GT/G●	R	Data, 8-42
6HA5		See 6HM5/6HA5

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6HB6	R	Data, 9-62 Use 6HB6/6HA6
6HB7	R	Data 1 to 3, 3-64
6HE5	R	Data, 2-69
6HF8	R	Data 1 to 4, 3-61
6HG5	R	Data 1&2, 3-64
6HJ8	R	Data, 3-62
6HL8	R	Data, 4-64
6HM5/6HA5	R	Data 1&2, 10-63
6HQ5	R	Suppl. Listing, 4-71▲
6HR5	R	Suppl. Listing, 4-71▲
6HR6	R	Data 1 & 2, 5-62
6HS6	R	Data 1 & 2, 5-62
6HS8	R	Data 1, 1-63
	R	Data 2 & 3, 1-62
6HZ6	R	Data 1 to 4, 1-63
6J4	D	Tent. Data, 4-44
	D	Curve 92CM-6543
6J4WA	R	See 8532/6J4WA
6J5, 6J5GT	R	Data Chart, 2-70□
6J6A	R	Data 1 to 3, 7-61
6J7	R	Data Chart, 2-70□
6J10	R	Data 1 to 5, 2-65 Use 6Z10/6J10
6JB6A	R	Data 1 & 2, 10-64
6JC6A	R	Data 1 & 2, 10-66
6JC8	R	Data 1 & 2, 5-62
6JD6	R	Data 1 & 2, 4-63
6JF6	R	Data 1 & 2, 2-67
6JG6A	R	Data 1 & 2, 10-64
6JH6	R	Data 1 to 3, 4-63
6JH8	R	Data 1, 5-62; 2& 3, 5-65
6JM6A	R	Suppl. Listing, 4-71▲
6JQ6	R	Data 1 & 2, 9-67
6JR6	R	Data 1 & 2, 9-68
6JS6C	R	Suppl. Listing, 4-71▲
6JT6A	R	Data 1 & 2, 10-64
6JU6	R	Data 1 & 2, 4-66
6JU8A	R	Data, 3-64
6JV8	R	Data 1 to 3, 6-63
6JZ8	R	Data, 4-64

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6K6GT	R	Data 1 & 2, 6-56
	R	Curve 92CM-4881R2
	R	Curve 92CM-6313
6K7, 6K8	R	Data Chart, 2-70□
6K11/ 6Q11	R	Data, 2-65
6KA8	R	Data 1 to 5, 5-62
6KD6	R	Data 1 & 2, 5-69
6KE8	R	Data 1 to 3, 4-63
6KL8	R	Data Chart, 2-70□
6KM6	R	Data 1 & 2, 9-65
6KM8	R	Data 1 to 3, 1-63
6KT6	R	Data 1 & 2, 10-66
6KT8	R	Data, 4-64
6KV6	R	Data 7-67
6KV6A	R	Data 1 & 2, 8-69
6KV8	R	Data 1 to 3, 6-66
6KY6	R	Data 1 & 2, 4-67
6KY8A	R	Data 1 to 3, 10-64
6KZ8	R	Data 1 to 3, 3-64
6L6, 6L6G●	R	Data 1 to 3, 11-54
	R	Curve 92C(M)-4581R1
	R	Curve 92C-4608
6L6GC	R	Data 1 to 5, 8-60
6L7	R	Data Chart, 2-70□
6LB6	R	Data 1 & 2, 5-69
6LC8	R	Data 1 to 4, 9-63
6LE8	R	Data 1 & 2, 12-65
6LF8	R	Data 1 to 3, 4-64
6LH6A	R	Suppl. Listing, 4-71▲
6LJ6A/ 6LH6A	R	Suppl. Listing, 4-71▲
6LM8	R	Data 1 to 3, 8-64
6LQ6	R	Data 1 & 2, 1-68 Use 6LQ6/ 6JE6C
6LQ8	R	Data 1 to 3, 2-66
6LT8	R	Suppl. Listing, 4-71▲
6MD8	R	Data 1 & 2, 9-65
6ME8	R	Data 1 to 3, 4-67
6MJ8	R	Data 1 & 2, 5-69
6MK8	R	Suppl. Listing, 4-71▲
6MN8	R	Data, 5-69
6MQ8	R	Data 1 to 3, 9-68
6MU8	R	Data 1 & 2, 5-70
6N5		See 6AB5/6N5
6N7, 6N7GT	R	Data Chart, 2-70□
6Q7	R	Data Chart, 2-70□
6Q11		See 6K11/6Q11
6S4A	R	Data 1 & 2, 1-62
6S8GT●	R	Data Chart, 2-70□
6SA7, 6SA7GT/G		Data, 1-43
	R	Curve 92C-4993
	R	Curve 92C-4989
6SB7Y	R	Data Chart, 2-70□
6SC7	R	Data Chart, 2-70□
6SF5	R	Data Chart, 2-70□
6SF7	R	Data Chart, 2-70□
6SG7	R	Data Chart, 2-70□
6SH7	R	Data Chart, 2-70□
6SJ7, 6SJ7GT●	R	Data, 6-48
	R	Curve 92CM-4939R1
	R	Curve 92CM-6444R1
	R	Curve 92CM-6409R1
6SK7	R	Data Chart, 2-70□
6SK7GT	R	Data Chart, 2-70□
6SL7GT	R	Data, 11-54
	R	Curve 92CM-6298
6SN7GTA●		Tent. Data 1 & 2, 6-54
	R	Curve 92CM-8122
6SN7GTB	R	Data, 3-55
6SQ7, 6SQ7GT/G●	R	Data, 12-43
	R	Curve 92C-6310
6SR7	R	Data Chart, 2-70□
6T4	R	Data Chart, 2-70□
6T8A	R	Tent. Data 1 & 2, 4-59
	R	Curve 92CM-9611R1
6U5	R	Data Chart, 2-70□
6U8A	R	Data 1 to 3, 1-61 Use 6U8A/6KD8 See also 6678/ 6U8A
6V3A	R	Tent. Data, 5-55
6V6	R	Data Chart, 2-70□
6V6GTA	R	Data 1 to 3, 1-62
6W4GT	R	Data, 1-62
6W6GT	R	Tent. Data, 10-53
	R	Curve 92CM-7942
6X4	R	Data 1 & 2, 10-53
	R	Rating Chart II 92CM-8024

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6X4 ..	R	Curve 92CM-8031
6X5,●		
6X5GT/G	R	Data, 3-43
6X8 ..	R	Data 1 to 3, 8-60
6Y6GA●	R	Data, 10-59
		Use 6Y6GA/6Y6G
6Z10 ..	R	Data 1 & 2, 4-66
		Use 6Z10/6J10
7A7● ..	R	Data Chart, 2-70□
7AU7 ..	R	Data, 4-67
7BP7A	C	Tent. Data, 6-48
7C5 ..	R	Data Chart, 2-70□
7C7 ..	R	Data Chart, 2-70□
7C24 ..		See 5762/7C24
7EY6 ..	R	On 7AU7 sheet
7F7 ..	R	Data Chart, 2-70□
7F8 ..	R	Data Chart, 2-70□
7KY6 ..	R	On 7AU7 sheet
7KZ6 ..	R	Data 1 & 2, 7-67
7MP7 ..	C	Data, 10-51
	C	Outline CE-7438R3
7N7 ..	R	Data Chart, 2-70□
7NP4 ..	C	Data 1 & 2, 12-66
	C	Data, 3, 9-67
	C	Data 4 to 6, 12-66
7TP4 ..	C	Tent. Data, 2-52
	C	Outlines & Notes CE-7691
	C	Curve 92CM-7688
7VP1 ..	C	Tent. Data 1 & 2, 11-52
7VP31. .	C	Data, 4-65
7WP4 ..	C	Data, 12-66
8AU8 ..	R	Data, 8-63
8AW8A.	R	Data, 8-63
8B10 ..	R	On 8AW8A sheet
8BA8A .	R	On 8AW8A sheet
8BH8 ..	R	On back of 8AW8A sheet
8BN8 ..	R	On back of 8AW8A sheet
8BQ5 ..	R	On back of 8AW8A sheet
8CG7● .	R	Data, 5-65
		Use 8FQ7/8CG7
8CM7 ..	R	On 8CG7 sheet
8CN7 ..	R	On 8CG7 sheet
8CS7 ..	R	On back of 8CG7 sheet
8CW5● .	R	On back of 8CG7 sheet
		Use 8CW5/XL86
8CX8 ..	R	On back of 8CG7 sheet
8D21 ..	T	Data Chart, 11-69*
8DP4 ..	C	Data, 9-58
8EB8● .	R	On back of 8CG7 sheet
		Use 8GN8/8EB8
8EM5 ..	R	Data, 1-63
8ET7 ..	R	Data, 7-61
8FQ7 ..	R	Data, 7-67
		Use 8FQ7/8CG7
8GJ7● .	R	On 8FQ7 sheet
		Use 8GJ7/PCF801
8GN8 ..	R	On 8FQ7 sheet
		Use 8GN8/8EB8
8GU7 ..	R	On 8FQ7 sheet
8HP4 ..	C	Data, 4-64
8JU8A, 8JV8 ..	R	On back of 8FQ7 sheet
8KA8, 8LC8 ..	R	On back of 8FQ7 sheet
8LT8 ..	R	Suppl. Listing, 4-71▲
8NP4 ..	C	Data, 3-64
8XP4 ..	C	Data, 4-64
8YP4 ..	C	Data, 4-65
9AU7 ..	R	Data, 7-67
9BR7 ..	R	Data Chart, 2-70□
9C25 ..	T	Data 1 to 3, 4-63
	T	Curve 92CM-7269
	T	Curve 92CM-7234
9KZ8 ..	R	Suppl. Listing, 4-71▲
9U8A ..	R	Data Chart, 2-70□
9WP4 ..	C	Data, 7-67
10AL11 .	R	On 9AU7 sheet
10BQ5 .	R	Suppl. Listing, 4-71▲
10C8 ..	R	Data Chart, 2-70□
10DE7 .	R	On 9AU7 sheet
10DR7 .	R	On back of 9AU7 sheet
10DX8●	R	On back of 9AU7 sheet
		Use 10DX8/LCL84
10EG7	R	Data, 3-61
10EM7.	R	Data, 10-64
10EW7 .	R	Suppl. Listing, 4-71▲
10GF7●	R	On 10EM7 sheet
10GF7A	R	On 10EM7 sheet

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Type	Section	Sheet & Date
12CL3 . .	R	On 12CK3 sheet
12CN5 . .	R	Data Chart, 2-70□
12CR6 . .	R	Tent. Data, 6-56
	R	Curve 92CM-9006
12CT3 . .	R	Data, 8-70
12CU5/ 12C5 . .	R	On 12CT3 sheet
12CX6 . .	R	Data Chart, 2-70□
12D4 . .	R	Tent. Data, 4-59
12DB5 . .	R	Data, 7-61
12DK6 . .	R	Suppl. Listing, 4-71▲
12DM4 .	R	Data, 5-61
12DQ6A●	R	On 12DM4 sheet
12DQ6B●	R	On 12DM4 sheet
12DQ7 .	R	Data Chart, 2-70□ Use 12BY7A/ 12BV7/12DQ7
12DS7 . .	R	Data Chart, 2-70□
12DT5 . .	R	Data, 10-59
12DT8 . .	R	On 12DT5 sheet
12DW7, 12DY8 .	R	Data Chart, 2-70□
12DZ6 . .	R	Data, 4-60
	R	Curve 92CM-10399
12ED5 . .	R	Data Chart, 2-70□
12EK6, 12EQ7 .	R	Data Chart, 2-70□
12F8, 12FK6 .	R	Data Chart, 2-70□
12FM6 .	R	Data Chart, 2-70□
12FQ7 . .	R	Data, 8-70
12FQ8 . .	R	Data 1 & 2, 10-60
12FV7 . .	R	Data Chart, 2-70□
12FX5 . .	R	Data, 7-63
12GC6 . .	R	Data, 7-61
12GE5 . .	R	Data, 10-64
12GJ5● .	R	On 12GE5 sheet
12GT5 . .	R	Data, 4-65
12GT5A●	R	On 12GT5 sheet
12GW6 .	R	On 12GT5 sheet Use 12GW6/12DQ6B
12H6 . .	R	On back of 12GT5 sheet
12HG7 .	R	Data 1 to 3, 4-65
12HL7 . .	R	Suppl. Listing, 4-71▲
12J5GT, 12J8 . .	R	Data Chart, 2-70□
12JB6A .	R	Data, 8-69
12JQ6 . .	R	On 12JB6A sheet
12JT6A .	R	On 12JB6A sheet
12K5 . .	R	Data Chart, 2-70□
12K7GT●	R	Data Chart, 2-70□
12KL8 . .	R	Data Chart, 2-70□
12KP4A .	C	Data, 9-58
12L6GT .	R	Data Chart, 2-70□
12L8GT .	D	Data, 10-43
12MD8 .	R	Suppl. Listing, 4-71▲
12R5 . .	R	Data Chart, 2-70□
12SA7 . .	R	Data, 10-64
12SC7 . .	R	Data Chart, 2-70□
12SF5 . .	R	Data Chart, 2-70□
12SF7 . .	R	Data Chart, 2-70□
12SG7 . .	R	Data Chart, 2-70□
12SH7 . .	R	Data Chart, 2-70□
12SJ7 . .	R	On 12SA7 sheet
12SK7 . .	R	Data Chart, 2-70□
12SK7GT	R	Data Chart, 2-70□
12SL7GT	R	On 12SA7 sheet
12SQ7 . .	R	On back of 12SA7 sheet
12SW7 . .	D	Tent. Data, 6-46
12SY7 . .	D	Tent. Data, 6-46
	D	Curve 92CM-6786
12T10 . .	R	Suppl. Listing, 4-71▲
12V6GT .	R	On back of 12SA7 sheet
12W6GT .	R	On back of 12SA7 sheet
12X4 . .	R	Data, 10-64
13CW4, 13DE7 . .	R	On 12X4 sheet
13DR7	R	On back of 12X4 sheet
13EM7 . .	R	On back of 12X4 sheet Use 13EM7/ 15EA7
13FD7 . .	R	On back of 12X4 sheet
13FM7 . .	R	Data, 4-66 Use 13FM7/ 15FM7
13GB5● .	R	On 13FM7 sheet Use 13GB5/ XL500
13GF7● .	R	On 13FM7 sheet
13GF7A .	R	On back of 13FM7 sheet
13J10●, 13Z10 .	R	On back of 13FM7 sheet Use 13Z10/ 13J10

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14GT8 . .	R	Data 1 & 2, 1-61
14WP4 . .	C	Data, 4-63
15AF11 .	R	Data, 5-65
15BD11●	R	On 15AF11 sheet Use 15BD11A
15CW5●.	R	On 15AF11 sheet Use 15CW5/ PL84
15FP22	C	Data, 2-70
15FM7 . .	R	On back of 15AF11 sheet Use 13FM7/ 15FM7
15FY7 . .	R	On back of 15AF11 sheet
15HB6 . .	R	On back of 15AF11 sheet
15KP22 .	C	Data, 7-67
15KY8A .	R	Data, 10-64
15LE8 . .	R	Suppl. Listing, 4-71▲
15LP22 .	C	Data 1 to 6, 7-67
15NP22 .	C	Data 1 to 5, 1-68
16BGP4 .	C	Data, 4-65
16CHP4A	C	Data, 7-67
16CMP4A	C	Data, 12-66
16GK6 . .	R	Data, 10-64
16RP4B .	C	Data, 10-65
16TP4 . .	C	Data, 9-58
17AB10/ 17X10 .	R	Suppl. Listing, 4-71▲
17AX3 . .	R	On 16GK6 sheet
17AX4GTA	R	On 16GK6 sheet
17AY3●.	R	On back of 16GK6 sheet
17AY3A .	R	On back of 16GK6 sheet
17BE3 . .	R	On back of 16GK6 sheet Use 17BE3/ 17BZ3
17BF11 .	R	On back of 16GK6 sheet Use 17BE3/ 17BZ3
17BH3 . .	R	Data Chart, 2-70□
17BH3A .	R	Data, 5-68
17BJP4 . .	C	Data, 4-63
17BP4D .	C	Data, 3-64
17BQ6GTB	R	Data Chart, 2-70□
17BR3/ 17RK19 .	R	Suppl. Listing, 4-71▲
17BW3 .	R	Suppl. Listing, 4-71▲

Type	Section	Sheet & Date
17C9 . .	R	Data Chart, 2-70□
17CFP4 .	C	Data 1 & 2, 10-59
	C	Raster-Cutoff-Range Charts 92CS-10246 & 92CS-10247
	C	Outline CE-10261B
	C	Curve 92CM-9241R1
17CK3 . .	R	On 17BH3A sheet
17CSP4 .	C	Data, 3-62
17CT3 . .	R	On back of 17BH3A sheet
17CU5 . .	R	On back of 17BH3A sheet Use 17CU5/17C5
17D4 . .	R	On back of 17BH3A sheet
17DAP4 .	C	Data, 4-60
17DE4 . .	R	On back of 17BH3A sheet
17DM4A	R	Data, 5-65
17DQP4 .	C	Data, 3-62
17DRP4 .	C	Data, 4-63
17DSP4 .	C	Data 1 to 3, 4-60
	C	Outline CE-10375B
	C	Charts 92CS-10376, -10377
	C	Curve 92CM-10382
17DWP4 .	C	Data, 1-63
17DXP4 .	C	Data 1 to 5, 8-60
17EFP4 .	C	Data, 10-65
17EZP22	C	Data 1 to 4, 11-69
17GE5 . .	R	Data Chart, 2-70□
17GJ5A .	R	Data, 8-70
17GV5 . .	R	Data Chart, 2-70□
17GW6/ 17DQ6B	R	On 17GJ5A sheet
17HP4C .	C	Data, 1-64
17JB6A .	R	On 17GJ5A sheet
17JF6 . .	R	On back of 17GJ5A sheet
17JG6A .	R	On back of 17GJ5A sheet
17JM6A .	R	Suppl. Listing, 4-71▲
17JQ6 . .	R	Data, 8-69
17JR6 . .	R	On 17JQ6 sheet
17JT6A .	R	On 17JQ6 sheet
17JZ8, 17KV6 .	R	On back of 17JQ6 sheet

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17KV6A	R	On back of 17JQ6 sheet
17LP4B	C	Data, 1-64
17QP4B	C	Data, 10-63
18AJ10	R	Suppl. Listing, 4-71▲
18FW6A	R	Data 1 & 2, 7-61
18FX6A	R	Data 1 & 2, 7-61
18FY6A	R	Data 1 & 2, 7-61
18GD6A	R	Data 1 & 2, 1-62
19ABP4	C	Data, 4-63
19AFP4	C	Data, 5-62
19AJP4	C	Data, 5-62
19AU4GTA	R	Data Chart, 2-70□
19AVP4	C	Data 1 to 5, 10-60
19AYP4	C	Data, 5-62
19BDP4	C	Data, 5-62
19BG6GA	R	Data Chart, 2-70□
19CG3	R	Data, 8-70
19CHP4	C	Data, 3-62
19CL8A	R	On 19CG3 sheet
19CMP4	C	Data, 7-65
19CXP4	C	Data, 10-65
19DQP4	C	Data, 1, 12-66
	C	Data 2, 2-64
19DRP4	C	Data, 4-65
19DSP4	C	Data, 7-65
19EA8	R	On 19CG3 sheet
19EBP4	C	Data, 2-67
19EGP4	C	Data, 2-67
19ENP4A	C	Data, 2-66
19FEP4B	C	Data, 12-66
19FLP4	C	Data, 2-66
19FNP4	C	Data, 10-66
19FX5	R	On back of 19CG3 sheet
19GEP4A	C	Data, 7-67
19GJP4A	C	Data, 12-66
19GVP22	C	Data, 4-67
19GWP22	C	Data 1 to 5, 4-67
19HCP22	C	Data 1 to 4, 5-68
19HMP22	C	Data, 2-70
19HNP22	C	Data 1 to 4, 9-68
19HR6	R	On back of 19CG3 sheet
19HS6	R	On back of 19CG3 sheet
19HYP22	C	Data 1 to 4, 5-69
19J6	R	Data Chart, 2-70□
19JN8/ 19CL8A	R	Suppl. Listing, 4-71▲
19T8	R	Data Chart, 2-70□
19X8	R	Data Chart, 2-70□
19YP4	C	Data 1 to 5, 10-60
20AQ3/ LY88	R	Suppl. Listing, 4-71▲
20EZ7	R	Data 1, 5-61
	R	Data 2, 10-60
20SP4	C	Data 1 & 2, 1-68
20TP4	C	Data 1 & 2, 12-68
21AMP4B	C	Data, 1-64
21AVP4C	C	Data, 2-64
21AWP4A	C	Data, 4-65
21AXP22A	C	Tent. Data 1 to 3, 8-56
	C	Chart 92CM-8565R1
	C	Drawing CE-8399R4B
	C	Gauge Data CE-8844B
	C	Curve 92CM-8426R3
21CBP4A	C	Data, 1-63
21CQP4	C	Data, 4-60
21CYP22A	C	Data 1 to 7, 10-60
21DHP4	C	Data, 3-62
21DLP4	C	Tent. Data 1 & 2, 9-58
	C	Raster-Cutoff-Range Charts 92CS-9349V & 92CS-9350V
	C	Outline CE-9660B
	C	Curve 92CS-9143R1
21DSP4	C	Data 1 & 2, 10-59
	C	Outline CE-10255B
	C	Raster-Cutoff-Range Chart 92CS-9911
	C	Curve 92CM-9909
21EP4C	C	Data, 1-64
21EYP4	C	Data, 6-64
21FDP4	C	Data, 5-62
21FP4D	C	Data, 1-64
21FVP4	C	Data, 10-65
21GUP22	C	Data, 5-68
21GVP22	C	Data 1 to 4, 5-68
21LR8	R	Data 1 to 3, 10-65
21MP4●	C	Data, 9-58
21WP4B	C	Data, 10-65
21XP4B	C	Data, 10-65
21YP4B	C	Data, 1-64
21ZP4C	C	Data, 1-64
22BH3●	R	Data, 2-67
22BH3A	R	On 22BH3 sheet

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Type	Section	Sheet & Date
22BW3 . .	R	Suppl. Listing, 4-71▲
22DE4 . .	R	On 22BH3 sheet
22JF6 . .	R	On back of 22BH3 sheet
22JG6A .	R	Data, 8-69
22JP22 .	C	Data 1 to 5, 4-67
22JR6 . .	R	On 22JG6A sheet
22JU6 . .	R	On 22JG6A sheet
22KM6 .	R	On 22JG6A sheet
22KP22 .	C	Data, 4-67
22KV6A.	R	On back of 22JG6A sheet
22UP22 .	C	Data 1 to 4, 9-68
22WP22 .	C	Data, 8-69
23AHP4 .	C	Data 1 to 5, 3-61
23ARP4 .	C	Data, 12-65
23ASP4 .	C	Data, 3-61
23BDP4 .	C	Data, 1-63
23BGP4 .	C	Data, 5-65
23BJP4 .	C	Data, 3-62
23BKP4 .	C	Data, 5-62
23BQP4 .	C	Data, 3-62
23BTP4 .	C	Data, 2-65
23CBP4•.	C	On 23BTP4 sheet
23CGP4 .	C	On 23BTP4 sheet
23CP4 . .	C	Data 1 to 6, 8-60
23CQP4 .	C	Data, 5-65
23DAP4 .	C	Data, 8-63
23DBP4 .	C	Data, 8-64
23EKP4 .	C	Data, 8-64
23ENP4 .	C	Data, 8-64
23EP4 . .	C	Data 1 to 5, 8-60
23EQP4 .	C	Data, 12-66
23ERP4 .	C	Data, 12-66
23ETP4 .	C	Data, 8-64
23EZP4 .	C	Data, 10-66
23FDP4 .	C	Data, 8-64
23FMP4 .	C	Data, 8-64
23FP4A .	C	Data, 4-63
23FRP4 .	C	Data, 2-67
23FSP4 .	C	Data, 2-67
23GSP4 .	C	Data, 10-65
23HFP4A	C	Data, 7-65
23HGP4.	C	Data, 12-66
23HUP4A	C	Data, 7-67
23HWP4A	C	Data, 12-66
23JP4 . .	C	Data, 4-63
23MP4 . .	C	Data 1 to 6, 10-60
23NP4 . .	C	Data, 4-65
23YP4 . .	C	Data, 3-62
24AEP4 .	C	Data, 1-63
24AHP4 .	C	Tent. Data 1 & 2, 6-57
	C	Raster-Cutoff-Range Chart 92CS-9349
	C	Outline CE-9345B
	C	Raster-Cutoff-Range Chart 92CS-9350
	C	Curve 92CS-9351
24AUP4 .	C	Tent. Data 1 & 2, 4-59
	C	Raster-Cutoff-Range Charts 92CS-9919 & 92CS-9918
	C	Outline CE-9917B
	C	Curve 92CM-9352
24BEP4 .	C	Data, 10-64
24BF11 .	R	Suppl. Listing, 4-71▲
24CP4B .	C	Data, 1-64
24JE6A .	R	On back of 22JG6A sheet Use 24LQ6/24JE6C
24LQ6 . .	R	On back of 22JG6A sheet Use 24LQ6/24JE6C
25AJP22	C	Data 1 to 4, 9-68
25AV5GA	R	Data, 10-59
25AX4GT	R	On 25AV5GA sheet
25BCP22	C	Data 1 to 4, 8-69
25BDP22	C	Data 1 & 2, 8-69
25BGP22	C	Data, 2-70
25BHP22	C	Data, 2-70
25BK5 . .	R	On 25AV5GA sheet
25BQ6GTB/ 25CU6 .	R	On 25AV5GA sheet
25C5 . .	R	Tent. Data, 7-58
	R	Curve 92CM-8908R2
25CA5 . .	R	Data Chart, 2-70□
25CD6GB	R	Data, 8-70
25CG3 . .	R	On 25CD6GB sheet
25CK3 . .	R	On 25CD6GB sheet
25CM3 . .	R	On back of 25CD6GB sheet
25CT3 . .	R	On back of 25CD6GB sheet
25CU6 . .		See 25BQ6GTB/ 25CU6
25DN6 . .	R	Tent. Data, 8-57
	R	Outline CE-9343

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	T	Data 2 & 3, 10-56
	T	Data 4, 2-59
	T	Outline CE-4786R5
	T	Curve 92CM-6197
834	T	Data Chart, 11-69*
835● ...	T	Data, 12-42
836	T	On 835 sheet
837●,845	T	Data Chart, 11-69*
857B ..	T	Data 1 & 2, 7-55
	T	Shell CE-4653R2
860● ...	T	Data Chart, 11-69*
866A ..	T	Data 1 & 2, 8-57
868	P	Data, 3-61
869B ..	T	Data 1 & 2, 11-52
	T	Curve 92CM-7634
872A ..	T	Data 1 & 2, 8-57
880● ..	T	Data Chart, 11-69*
884,885	F	Data 1 & 2, 12-44
891R,892	T	Data Chart, 11-69*
892R ..	T	Data Chart, 11-69*
902A ..	C	Data 1, 7-45
917	P	Data, 10-56
	P	Curve 92CM-4360R2
918	P	Data 1 & 2, 3-61
919	P	Data, 10-56
920	P	Data 1 & 2, 3-62
921	P	Data, 12-56
922	P	Data, 10-56
923	P	Data, 8-47
925	P	Data, 1-62
	P	Curve 92CM-6208R1
926	P	Data, 12-56
927	P	Data 1 & 2, 3-62
929	P	Data 1 & 2, 1-62
930	P	Data 1 & 2, 3-61
931A ..	P	Data 1 to 6, 11-69
934	P	Data 1 & 2, 3-62
935	P	Data, 5-62
	P	Curve 92CM-6478R1
955	D	Data, 6-44
	D	Curve 92C-5561R1
959	D	Data, 6-44
991	F	Data, 12-39
1609● ..	D	Data, 1-43
	D	Curve 92C-6355
1611 ..	D	Data, 1-43 (On back of 1609 Curve 92C-6355)
1612 ..	D	Data, 1-43
1616 ..	T	Data, 5-42
1620 ..	D	On back of 1612 sheet
1621 ..	D	Data, 1-43
1622 ..	D	Data, 8-43
1624, 1625 ..	T	Data Chart, 11-69*
1629 ..	D	Data, 6-44
1635 ..	D	Data, 4-47
	D	Curve 92C-6358
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1946 ..	F	Tent. Data, 6-47
1947 ..	F	Tent. Data, 6-47
	F	Curve 92CM-6849
1949 ..	F	Data, 3-54
	F	Curve 92CM-6851
2020 ..	P	Data 1 to 6, 5-69
2050 ..	F	Data, 6-48
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	F	Curve 92CM-6274R1
2050A .	F	Data 1 to 3, 3-61
2054 ..	T	Data 1 to 3, 6-66
2060 ..	P	Data, 10-66
2061 ..	P	Data, 6-66
2062 ..	P	Data, 10-66
2063 ..	P	Data 1, 6-66
2064B ..	P	Data 1 & 2, 6-66
2065 ..	P	Data 1 & 2, 6-66
4028A ..	T	Data 1 to 5, 9-65
4037A ..	T	Data 1 to 4, 7-65
4041 ..	T	Data 1 to 3, 12-68
4053 ..	T	Data 1 & 2, 5-65
4054 ..	T	Data 1 to 3, 12-68
4055 ...	T	Data 1 & 2, 9-67
	T	Data 3, 7-65
4058 ...	T	Data 1 to 3, 2-66
4062A .	T	Data 1 to 3, 7-67
4068 ..	T	Data 1 & 2, 2-70
4070, 4071 ..	T	Data 1 & 2, 8-70
4072 ...	T	Data 1 & 2, 8-70
4438, 4439 ..	P	Data 1 & 7, 5-70
4440 ...	P	Data 1 to 4, 8-63
4441 ...	P	Data 1 to 4, 8-63
4441A .	P	Data, 3-64
4449A ..	P	Data 1 to 3, 6-64
4459 ...	P	Data 1 to 5, 6-64
4460 ...	P	Data 1 to 5, 6-64
4461 ...	P	Data 1 to 5, 5-65
4463 ...	P	Data 1 to 5, 6-64
4464 ...	P	Data 1 to 5, 8-64

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4478 ..	P	Data, 2-69
4486 ..	C	Data, 12-66
4490 ...	C	Data 1, 10-66
4491 ...	C	Data 1 & 2, 10-66
4492 ..	P	Data 1 & 2, 5-70
4493, 4494, 4495 ..	P	Data 1 & 2, 1-68
4499 ..	C	Data, 12-65
4500 ..	P	Data 1 to 7, 12-66
4503A ..	P	Data 1 to 6, 12-68
4510 ..	C	Data 1, 4-71
	C	Data 2, 10-66
4516, 4517 ..	P	Data 1 to 14, 11-70
4518 ..	P	Data 1 to 9, 5-68
4521 ..	P	Data 1 to 9, 2-70
4522 ..	P	Data 1 to 9, 12-68
4523, 4524, 4525 ..	P.	Data 1 to 15, 2-67
4536 ..	P	Data 1 to 4, 12-68
4542 ..	P	Data 1 to 5, 12-68
4547 ..	P	Data 1 to 6, 2-71
4557 ..	C	Data 1 to 3, 2-69
4560 ..	C	Data 1 to 4, 5-69
4589 ..	P	Data 1 to 4, 8-70
4600A ..	T	Data 1 to 4, 9-62
4604 ..	T	Data 1, 1-61
	T	Data 2, 1-63
	T	Data 3, 1-61
4616 ..	T	Data 1 to 4, 6-66
4616V1.	T	Data, 6-66
4617 ..	T	Data 1 & 2, 6-66
4618 ..	T	Data 1 to 6, 9-67
4621 ..	T	Data, 9-68
4624 ..	T	Data 1 to 4, 4-65
4626 ..	T	Data, 9-68
4628 ..	T	Data 1 to 5, 12-65
4630 ..	T	Data, 9-68
4631 ..	T	Data, 9-68
4632 ..	T	Data, 9-68
4635 ..	T	Data, 9-68
4636 ..	T	Data 1 & 2, 9-68
4637 ..	T	Data, 9-68
4638 ..	T	Data, 9-68
4651 ..	T	Data, 2-69
4652/8042 ..	T	Data 1 & 2, 5-69
4658 ..	T	Data 1 to 5, 4-71
4659, 4660 ..	T	Data 1 to 5, 2-71
4661 ..	T	Data 1 to 4, 11-70
4662 ..	T	Data 1 to 7, 8-70
5550 ..	F	Data 1 to 4, 3-61
5551A ..	F	Tent. Data 1 to 3, 4-59
	F	Charts 92CS-9695, -9698
	F	Rating Chart 92CM-9692
5552A ..	F	Tent. Data 1 & 2, 4-59
	F	Outline CE-9772R1A
	F	Rating Chart 92CM-9710
5556 ..	T	Data Chart, 11-69*
5557 ..	F	Data, 4-58
	F	Curve 92CM-9301T; -9302T
5558 ..	T	Data, 4-53; Curve 92CM-7856
5559 ..	F	Data, 3-51
	F	Curves CE-6704T1-7562T
5560 ..	F	Data, 3-51
	F	Curves CE-6705T1-7568T
5561 ..	T	Tent. Data, 5-46
5563A ..	F	Data 1 to 3, 4-57
	F	Curve 92CM-8302
	F	Curves CE-8300T -8316T
	F	Curve 92CM-8303
5581 ..	P	Data 1 & 2, 3-61
5582 ..	P	Data, 12-56
	P	Curve 92CM-6823
5583 ..	P	Data 1 & 2, 3-61
5618 ..	T	Tent. Data 1 & 2, 10-47
	T	Curve 92CM-6881
	D	Tent. Data 1 to 3, 6-57
5636 ..	D	Curve 92CM-9212
	D	Curve 92CM-9210
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5642 ..	D	Tent. Data, 4-59
5651A ..	F	Data 1 & 2, 8-63
5652 ..	P	Data, 3-62
	P	Data 2, 9-63
5653 ..	P	Data, 3-62
5654 ..	D	Tent. Data, 1-53
5670 ..	D	Data 1 to 4, 8-63

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6082	D	Data 1 & 2, 8-53
6101	D	Tent. Data 1 to 3, 10-53
	D	Curve 92CM-8033
6111	D	Tent. Data 1 to 3, 4-58
	D	Curve 92CM-9444
6130/ 3C45	F	Data 1 & 2, 4-59
6136	D	Tent. Data 1 to 3, 4-58
	D	Curve 92CM-6613
	D	Curve 92CM-6623
6246A	T	Data Chart, 11-69*
6146B/ 8298A	T	Data 1 to 7, 2-64
6155	T	Data Chart, 11-69*
6156•	T	Data Chart, 11-69*
6159•	T	Data Chart, 11-69*
6159B	T	Data, 2-65
6159W/ 7357	T	Data, 7-63
6161	T	Data 1 to 4, 8-57
	T	Notes CE-7704R2B
	T	Mounting Arrangement CE-6833R2
	T	Curve 92CL-7771R1
6166	T	Data 1 to 9, 5-61
	T	Data 10, 1-62
	T	Data 11, 5-61
6166A/ 7007	T	Data, 1, 9-65
	T	Data 2, 10-60
	T	Data 3, 9-65
	T	Data 4 to 9, 10-60
	T	Data 10, 1-62
	T	Data 11, 10-60
6173	D	Data 1 & 2, 9-58
	D	Curves 92CS-9638 & 92CS-9637
6181	T	Data Chart, 11-69*
6197	D	Tent. Data, 3-54
	D	Curve 92CM-8150
	D	Curve 92CM-8149
6199	P	Data 1 to 5, 10-66
6201	D	Tent. Data 1 to 4, 10-56
	D	Curve 92CM-9021
	D	Curve 92CM-9022
6211	D	Data 1 & 2, 4-56
	D	Curve 92CM-7822
6217	P	Data 1 & 2, 2-66
6263A	T	Data 1 to 6, 3-62
6264A	T	Data 1 to 6, 10-60
6293	T	Data 1 & 2, 4-63
	T	Rating Chart I 92CM-8012
	T	Curves CE-8017T-8016T
6328	P	Data 1 to 4, 12-65
6336A	D	Data 1 & 2, 5-62
6342A	P	Data 1, 6-66
	P	Data 2, 7-63
	P	Data 3, 6-66
	P	Data 4, 7-63
6350	D	Tent. Data 1 & 2, 6-57
	D	Curve 92CM-9272
6405/ 1640	P	Data, 8-63
	P	Data 2, 3-62
6417	T	Data, 5-54
6448	T	Tent. Data 1 to 3, 5-54
	T	Outline CE-8256A
	T	Outline CE-8256C
	T	Gauge CE-8254
	T	Curve 92CM-8252
	T	Curve 92CM-8247
	T	Curve 92CM-8245
6472	P	Data 1 to 4, 12-65
6499	C	Tent. Data 1 & 2, 8-56
	C	Outline & Notes CE-8891
	C	Curve 92CM-8948
	C	Curve 92CL-8961
6521	T	Tent. Data 1 & 2, 5-55
	T	Drawing CE-8538-8537B
	T	Curve 92CM-8527
	T	Curve 92CM-8533
6524	T	Data 1, 6-56
	T	Tent. Data 2 & 3, 8-54
	T	Data 4, 6-56
	T	Rating Chart II 92CM-8348
	T	Outline CE-8346R2A
	T	Curve 92CM-8350
	T	Curve 92CM-8346
	T	Curve 92CM-8351
6550	D	Data 1 & 2, 5-62

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6562/ 5794A .	T	Data 1 & 2, 5-62
6570 . .	P	Tent. Data, 3-55
	P	Curve 92CM-8491
6655A. .	P	Data 1 to 5, 10-66
6660/ 6BA6. .	D	Data, 8-59
6661/ 6BH6. .	D	Data, 8-59
6662/ 6BJ6 . .	D	Data, 8-59
6663/ 6AL5. .	D	Data, 8-59
6664/ 6AB4. .	D	Data, 5-62
6669/ 6AQ5A	D	Data 1 & 2, 8-59
6676/ 6CB6A	D	Data, 5-62
6677/ 6CL6. .	D	Data, 8-59
6678/ 6U8A. .	D	Data 1 & 2, 8-59
6679/ 12AT7.	D	Data, 8-59
6680/ 12AU7A	D	Data, 8-59
6681/ 12AX7•	D	Data, 8-59 Use 6681/12AX7A
6806 . .	T	Data 1 to 4, 2-59
	T	Outline CE-8840R2B
	T	Notes CE-8840R2D
	T	Gauge CE-8253R2
	T	Drawing CE-8250R2
	T	Curve 92CM-8899
	T	Curve 92CM-8909
6810A. .	P	Data 1 to 6, 11-69
6816 . .	T	Data 1 to 5, 7-67
	T	Data 6, 9-62
	T	Data 7, 7-67
6850 . .	T	Data, 6-56
6855 . .		See 716/6855
6858 . .		See 760/6858
6861 . .	T	Data, 7-58
	T	Outline CE-8951R1
	T	Curves CE-8971T-8969T
6866 . .	C	Tent. Data 1, 10-56
	C	Tent. Data 2 & 3, 6-57
	C	Curve 92CM-9042
	C	Curve 92CM-9044
	C	Curve 92CM-9046
6883 . .	T	Data Chart, 11-69*
6883B/ 8032A/ 8552 . .	T	Data, 8-64
6884 . .	T	Data, 7-67
6887 . .	D	Tent. Data, 4-57
	D	Curve CE-9187T
6894 . .	T	Data, 1-63
6897 . .	T	Data Chart 11-69*
6903 . .	P	Data 1 & 2, 7-65
	P	Data 3 & 4, 7-63
6914, 6914A .	P	Data 1 to 4, 8-70
6922• . .	D	Data, 5-62 Use 6922/E88CC
6929 . .	P	Data 1 to 4, 8-70
6939 . .	D	Data 1 to 6, 10-60
6949 . .	T	Tent. Data 1 & 2, 7-58
	T	Tent. Data 3, 7-58 & Outline CE-9296A
	T	Notes CE-9296C & Drawing CE-9294
6952 . .	T	Data 1 to 3, 2-64
	T	Data 4 & 5, 5-61
6953 . .	P	Data 1 & 2, 3-61
6973 . .	R	Data 1, 10-60
	R	Tent. Data 2, 8-57
	R	Curve 92CM-9389
7007 . .		See 6166A/7007
7008 . .	T	Tent. Data 1 to 3, 9-58
	T	Curves 92CS-8941R1 & 92CS-9472R1
	T	Outline CE-9470B
	T	Drawings CE-8981R1 -9486
	T	Curves 92CS-9469R1 & 92CS- 9285R1
	T	Curves 92CS-9471R1 & 92CS-9466
7014 . .		See 604/7014
7018 . .		See 615/7018
7019 . .		See 635/7019
7021 . .		See 714/7021
7025 . .	R	Tent. Data, 4-59
	R	Curve 92CM-6879

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7027A . .	R	Data 1 & 2, 8-59
	R	Curve 92CM-10132
	R	Curve 92CM-10126
	R	Curve 92CM-9568
7035/ 4X150D•	T	Data, 9-62
7038 . .	P	Data 1 & 2, 2-65
	P	Data 3 & 4, 4-64
	P	Curve 92CM-7783R2
	P	Dark Current Range 92CM-9497
7044 . .	D	Data 1 to 3, 3-62
7054 . .	D	Data, 5-62 See also 8077/7054
7055 . .	D	Tent. Data, 11-58
	D	Curve 92CS-9774
7056 . .	D	Tent. Data 1 & 2, 11-58
	D	Curve 92CM-9789
7057 . .	D	Tent. Data 1 & 2, 11-58
	D	Curve 92CM-9792
7058 . .	D	Tent. Data 1 & 2, 11-58
	D	Curve 92CM-9805
7059 . .	D	Tent. Data 1 & 2, 11-58
	D	Curve 92CM-9810
	D	Curve 92CM-9809
7060 . .	D	Tent. Data 1 to 3, 11-58
	D	Curve 92CM-9806
	D	Curve 92CM-9811
	D	Curve 92CM-9813
7061 . .	D	Tent. Data 1 & 2, 11-58
	D	Curve 92CM-9794
	D	Curve 92CM-9801
7094 . .	T	Data 1 to 8, 5-62
7102 . .	P	Data 1 to 6, 11-69
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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:

Ratings = [Maximum capabilities of any electron device of the type rated]

Design-Center System:

Ratings = [Maximum capabilities of any electron device of the type rated] — [Allowance for electron-device variations] — [Allowance for component and supply variations]

Design-Maximum System:

Ratings = [Maximum capabilities of any electron device of the type rated] — [Allowance for electron-device variations]

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.

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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.

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

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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 com-

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(continued from preceding page)

ponent 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

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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

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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(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

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.

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 operating 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

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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.

(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 rec-

TUBE RATINGS

(continued from preceding page)

tifier 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**

TUBE RATINGS

(continued from preceding page)

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 recognize 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 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-

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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

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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-

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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)

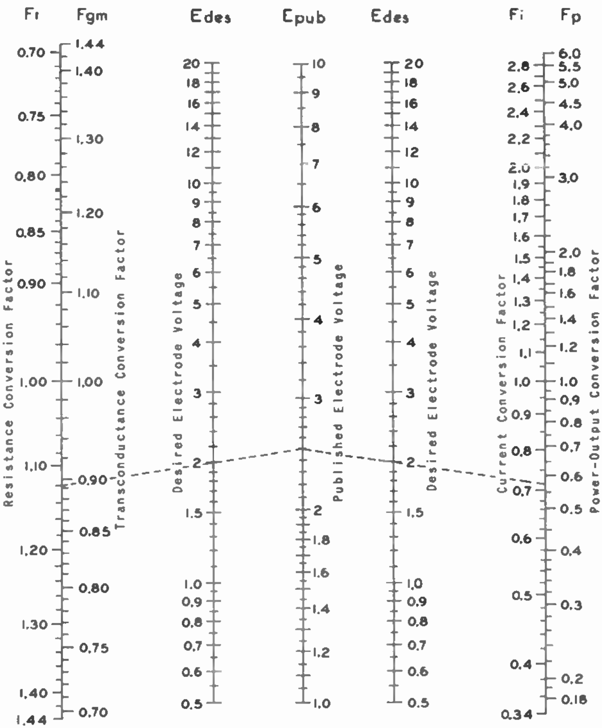
this type are sometimes designated as secondary-emission cathodes. They are used in certain glow-discharge tubes, and also in multiplier phototubes where they contribute to electron multiplication in the successive dynode stages.

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)

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

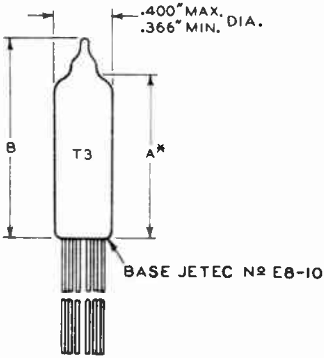
LIMITATIONS

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 Types



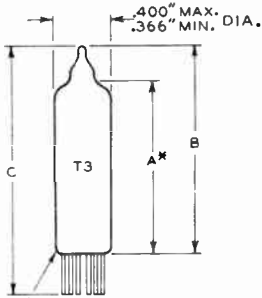
OUTLINE JETEC No.	DIMENSION A ± 0.060 INCHES	DIMENSION B Max. INCHES
3-1	1.075	1.375
3-2	1.200	1.500
3-3	1.450	1.750
3-4	1.700	2.000
3-8	1.325	1.625
3-11	0.950	1.250

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

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

OUTLINES—Glass Tubes

SUBMINIATURE--Small-Button Sub-Minar 8-Pin Base Types



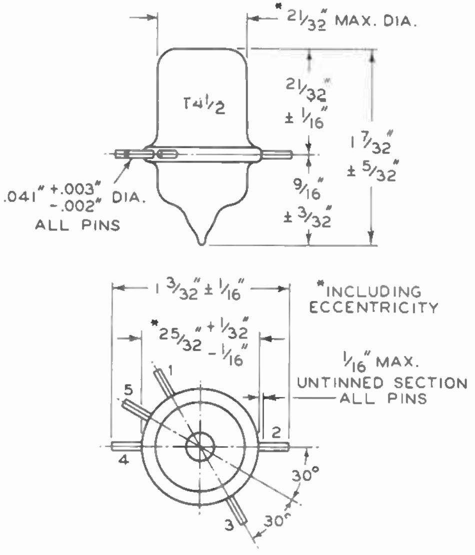
OUTLINE JETEC No.	DIMENSION		
	A ± 0.060 INCHES	B Max. INCHES	C Max. INCHES
3-5	1.200	1.500	1.750
3-9	1.075	1.375	1.625
3-10	1.450	1.750	2.000
3-12	0.950	1.125	1.500
3-13	1.325	1.625	1.875
3-14	1.575	1.875	2.125
3-15	1.700	2.000	2.250

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

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

OUTLINES—Glass Tubes

ACORN--Radial 5-Pin Base Type



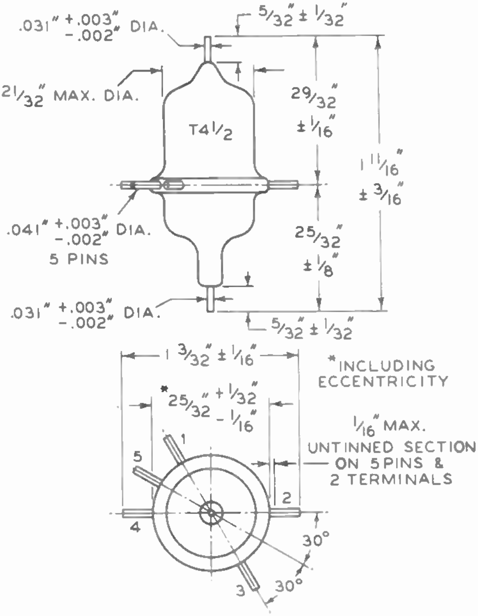
JETEC No.4-1

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

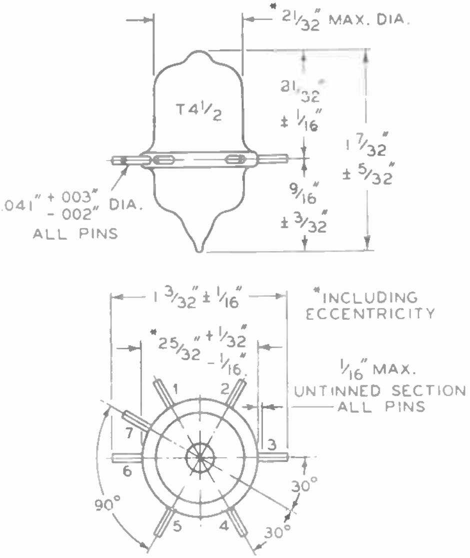
For additional socket design information, see back of "Outlines 3" sheet

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES — Glass Tubes

ACORN--Radial 7-Pin Base Type



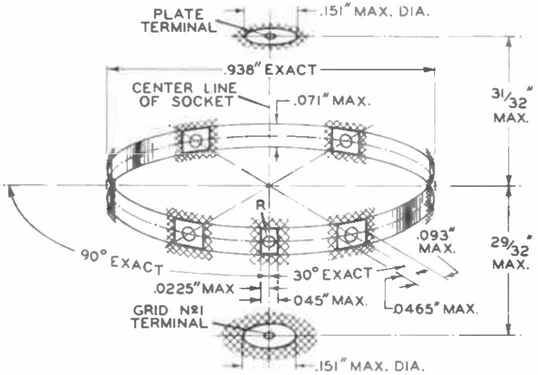
JETEC No.4-2

For additional socket design information, see back of this sheet

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.

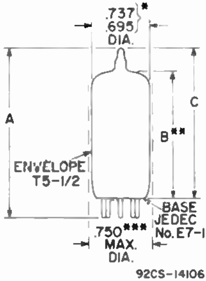
The clear area for pin position R is narrower than the others because pin position R is used as a reference for the other pins.

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

MINIATURE — Miniature 7-Pin Base Types with T5-1/2 Bulbs



DIMENSIONS IN INCHES

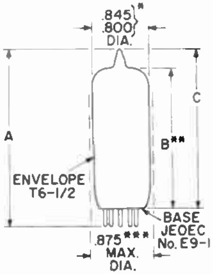
OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)			
	A	B		C
	Max	Min	Max	Max
[illegible]	1.625	.906	1.094	1.375
[illegible]	1.750	1.031	1.219	1.500
[illegible]	2.125	1.406	1.594	1.875
[illegible]	2.625	[illegible]	2.094	2.375

* Major diameter as checked by ring gauges of 0.25 inch thickness. The maximum gauge should clear the bulb above 0.38 inch from the base seat and the minimum gauge should not.

** Measured from the base seat to the bulb-top line as determined by a ring gauge of 0.437 inch I.D.

*** The diameter of the boundary cylinder as defined by the barriers of the pin alignment gauge (Gauge No. GE7-1, Sheet 24, Section 3 of EIA Standard RS-209A).

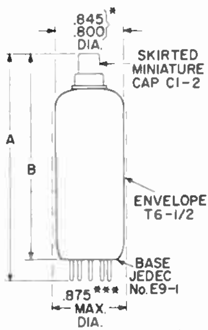
MINIATURE — Noval 9-Pin Base Types with T6-1/2 Bulbs



92CS-14107

DIMENSIONS IN INCHES

OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)			
	A	B		C
	Max	Min	Max	Max
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]



92CS-14108

DIMENSIONS IN INCHES

OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)		
	A	B	
	Max	Min	Max
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]••••	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

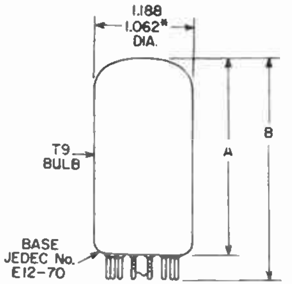
* Major diameter as checked by ring gauges of 0.25 inch thickness. The maximum gauge should clear the bulb above 0.38 inch from the base seat and the minimum gauge should not.

** Measured from the base seat to the bulb-top line as determined by a ring gauge of 0.437 inch I.D.

*** The diameter of the boundary cylinder as defined by the barriers of the pin alignment gauge (Gauge No. GE9-1, Sheet 30, Section 3 of EIA Standard RS-[illegible]).

**** Jedec Outline No. [illegible]-7 may also use non-standard C1-33 cap.

DUODECAR—12-Pin Base Types with T9 Bulbs

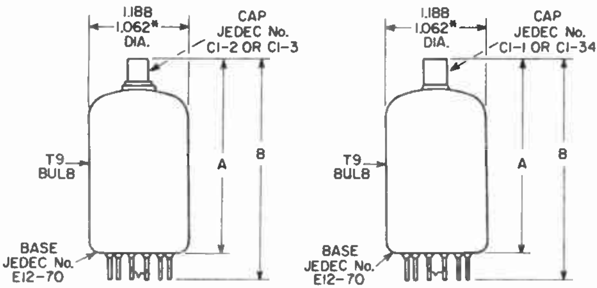


DIMENSIONS IN INCHES

* Applies to minimum diameter except in area of seal.

OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)		
	A		B
	Min.	Max.	Max.
9 - 55	1.000	1.250	1.625
9 - 56	1.250	1.500	1.875
9 - 57	1.500	1.750	2.125
9 - 58	1.750	2.000	2.375
9 - 59	2.000	2.250	2.625
9 - 60	2.250	2.500	2.875
9 - 61	2.500	2.750	3.125
9 - 62	2.750	3.000	3.375

Outlines with Top Cap



92CS-12526

DIMENSIONS IN INCHES

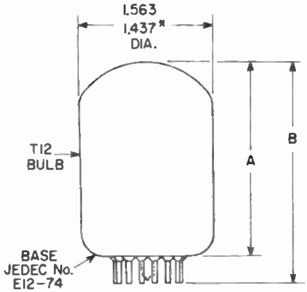
* Applies to minimum diameter except in area of seal.

OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)		
	A		B
	Min.	Max.	Max.
9 - 88	2.000	2.250	2.625
9 - 89	2.250	2.500	2.875
9 - 90	2.500	2.750	3.125
9 - 91	2.750	3.000	3.375
9 - 92	3.000	3.250	3.625
9 - 93	3.250	3.500	3.875
9 - 94	3.500	3.750	4.125
9 - 95	3.750	4.000	4.375

OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)		
	A		B
	Min.	Max.	Max.
9 - 96	2.000	2.250	2.625
9 - 97	2.250	2.500	2.875
9 - 98	2.500	2.750	3.125
9 - 99	2.750	3.000	3.375
9 - 100	3.000	3.250	3.625
9 - 101	3.250	3.500	3.875
9 - 102	3.500	3.750	4.125
9 - 103	3.750	4.000	4.375

Outlines
Glass Tubes

DUODECAR—12-Pin Base Types with T12 Bulbs

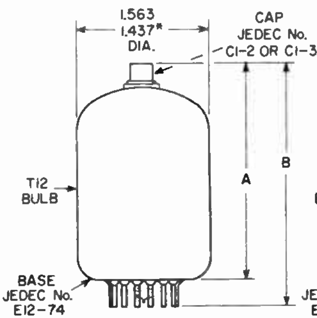


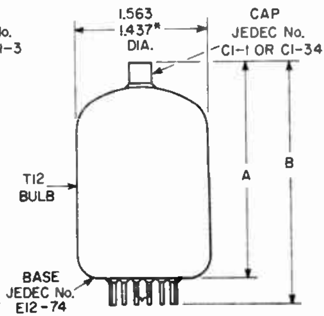
DIMENSIONS IN INCHES

* Applies to minimum diameter except in area of seal.

OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)		
	A		B
	Min.	Max.	Max.
12 - 52	1.250	1.500	1.875
12 - 53	1.500	1.750	2.125
12 - 54	1.750	2.000	2.375
12 - 55	2.000	2.250	2.625
12 - 56	2.250	2.500	2.875
12 - 57	2.500	2.750	3.125
12 - 58	2.750	3.000	3.375
12 - 59	3.000	3.250	3.625
12 - 60	3.250	3.500	3.875
12 - 61	3.500	3.750	4.125
12 - 62	3.750	4.000	4.375

Outlines with Top Cap





DIMENSIONS IN INCHES

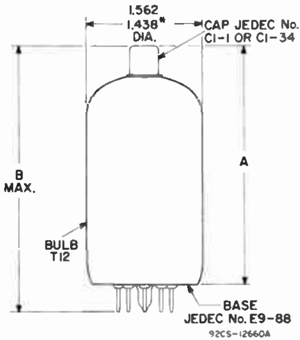
92CS-12525

* Applies to minimum diameter except in area of seal.

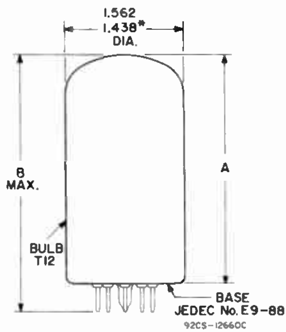
OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)		
	A		B
	Min.	Max.	Max.
12 - 75	2.000	2.250	2.625
12 - 76	2.250	2.500	2.875
12 - 77	2.500	2.750	3.125
12 - 78	2.750	3.000	3.375
12 - 79	3.000	3.250	3.625
12 - 80	3.250	3.500	3.875
12 - 81	3.500	3.750	4.125
12 - 82	3.750	4.000	4.375

OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)		
	A		B
	Min.	Max.	Max.
12 - 83	2.000	2.250	2.625
12 - 84	2.250	2.500	2.875
12 - 85	2.500	2.750	3.125
12 - 86	2.750	3.000	3.375
12 - 87	3.000	3.250	3.625
12 - 88	3.250	3.500	3.875
12 - 89	3.500	3.750	4.125
12 - 90	3.750	4.000	4.375

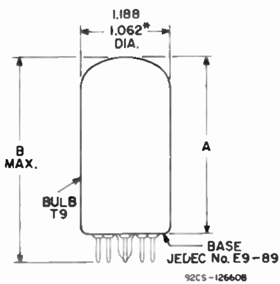
NOVAR—9-Pin Base Types



OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)		
	A		B
	Min.	Max.	Max.
12-116	3.500	3.750	4.130



OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)		
	A		B
	Min.	Max.	Max.
12-95	2.250	2.500	2.880
12-96	2.500	2.750	3.130
12-99	3.250	3.500	3.880

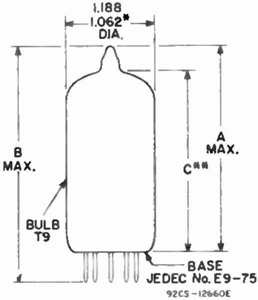


OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)		
	A		B
	Min.	Max.	Max.
9-107	1.750	2.000	2.380
–	2.375	2.625	3.005

* Applies to the minimum diameter except in the area of the seal.

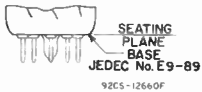
Outlines
Glass Tubes

NOVAR—9-Pin Base Types



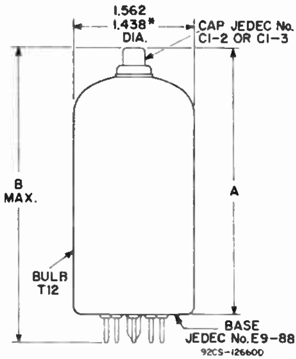
OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)			
	C		B	A
	Min.	Max.	Max.	Max.
—	2.050	2.230	3.080	2.700
—	2.405	2.585	3.110	2.730

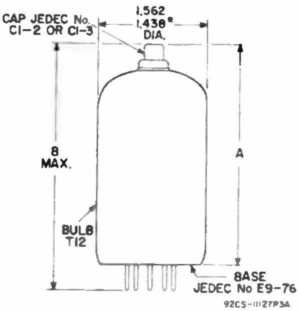
Botton-exhaust type has the same A & B dimensions as top-exhaust type shown



**Measured from the base seat to bulb top line as determined by a ring gauge of 0.600" I.D.

OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)		
	A		B
	Min.	Max.	Max.
—	2.875	3.125	3.505

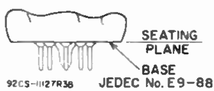




OUTLINE DRAWING NUMBER (JEDEC)	DIMENSIONS (INCHES)		
	A		B
	Min.	Max.	Max.
12-70•	2.910	3.170	3.550

Bottom-exhaust type has the same dimensions as top-exhaust type shown

• For E9-76 base



OUTLINES—Glass Tubes

GLASS OCTAL--Octal Base Types with T9 Bulbs

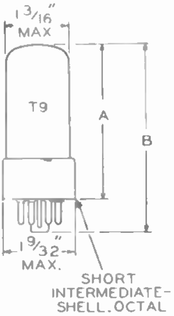


Fig. 1

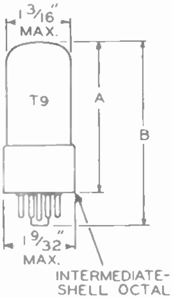


Fig. 2

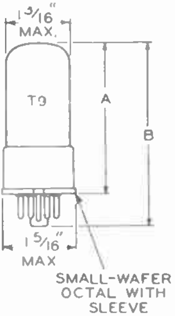
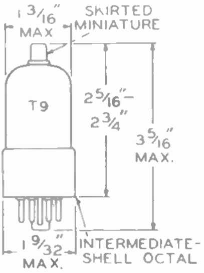
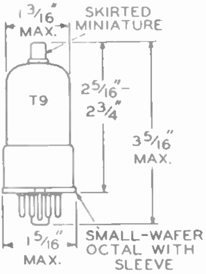


Fig. 3

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



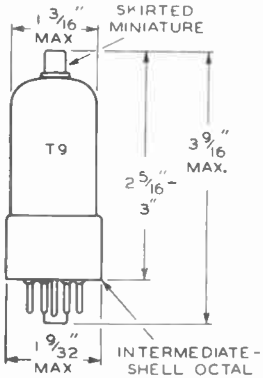
JETEC No. 9-18

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

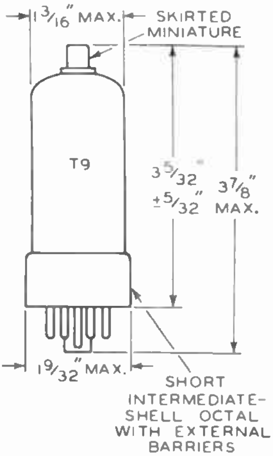
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES—Glass Tubes

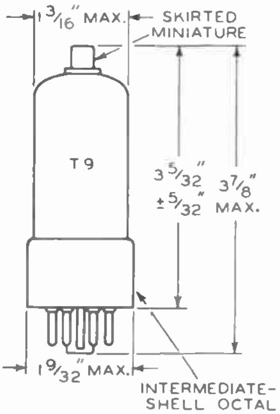
GLASS OCTAL--Octal Base Types with T9 Bulbs



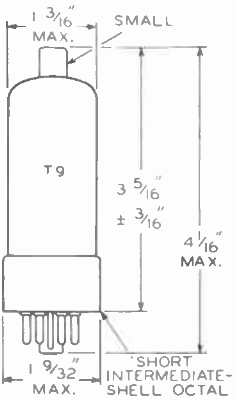
JETEC No. 9-23



JETEC No. None



JETEC No. None

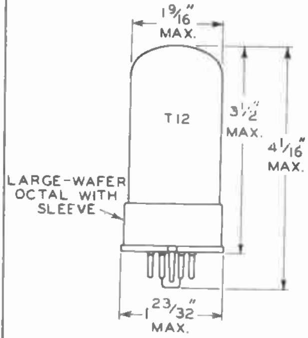


JETEC No. 9-51

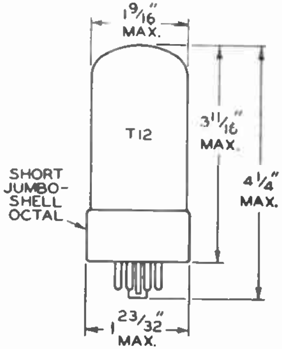
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES—Glass Tubes

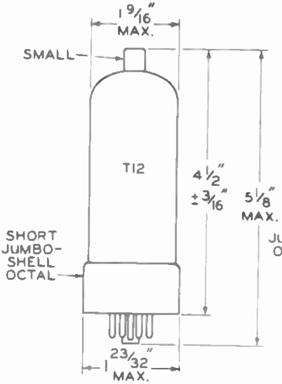
GLASS OCTAL--Octal Base Types with T12 Bulbs



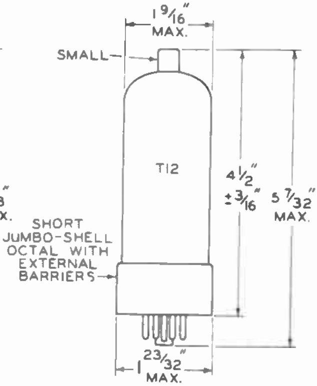
JETEC No. None



JETEC No. None



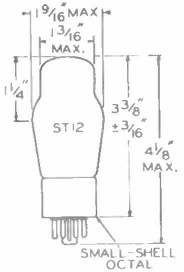
JETEC No. None



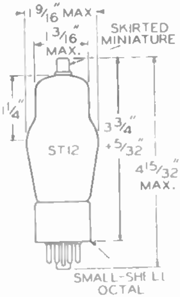
JETEC No. None

OUTLINES—Glass Tubes

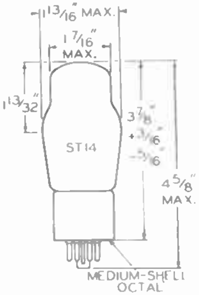
GLASS OCTAL--Octal Base Types with ST Bulbs



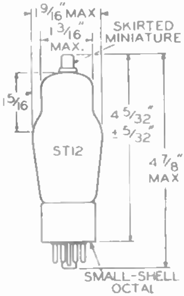
JETEC No. 12-7



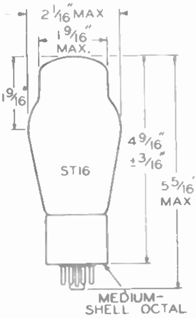
JETEC No. 12-8



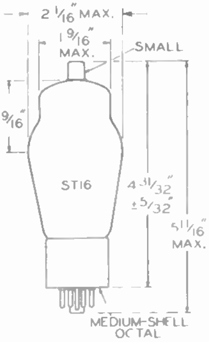
JETEC No. 14-3



JETEC No. None



JETEC No. 16-3

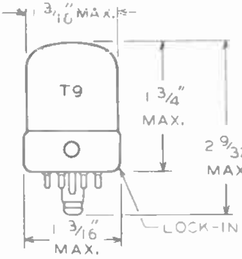


JETEC No. 16-5

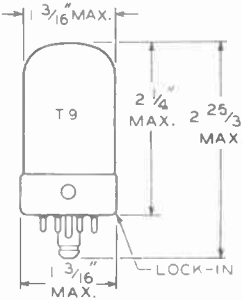
TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

OUTLINES—Glass Tubes

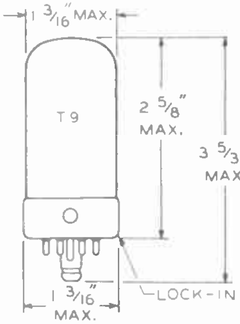
LOCK-IN--Lock-In 8-Pin Base Types



JETEC No.9-32



JETEC No.9-30

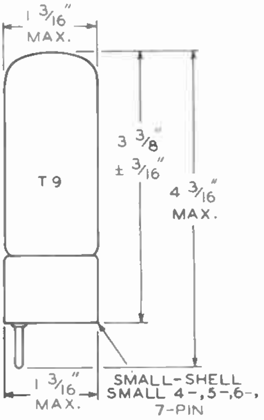


JETEC No.9-31

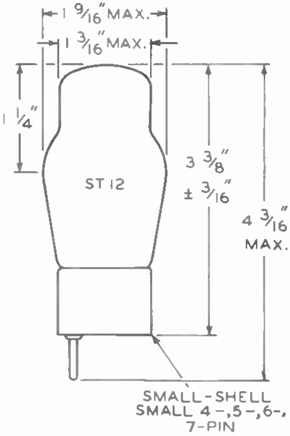
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES—Glass Tubes

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



JETEC No. 9-26



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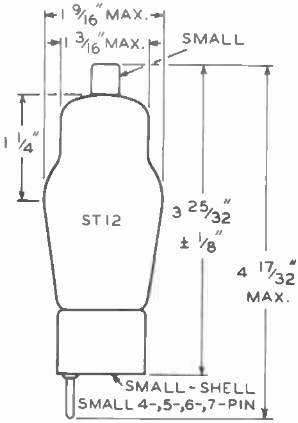
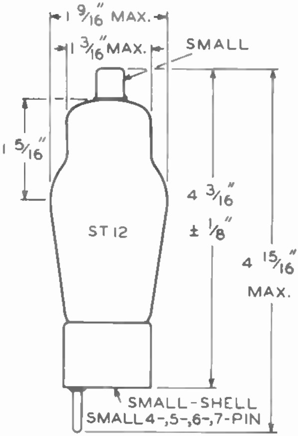


JETEC No. 12-6

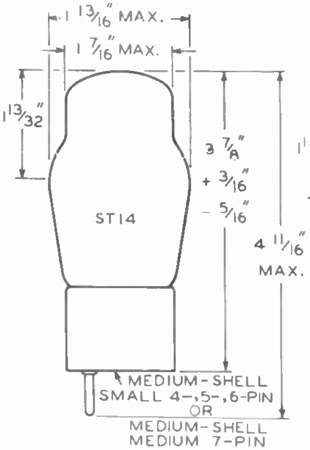


JETEC No. 12-2

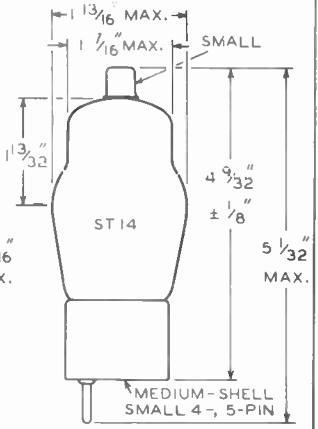
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES—Glass Tubes

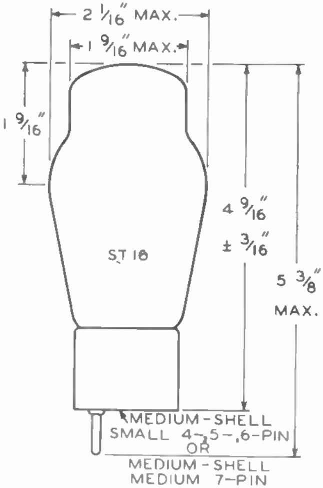
SMALL 4-PIN, SMALL 5-PIN, SMALL 6-PIN, & MEDIUM 7-PIN BASE TYPES



JETEC No. 14-1



JETEC No. 14-2

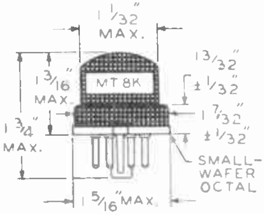


JETEC No. 16-1

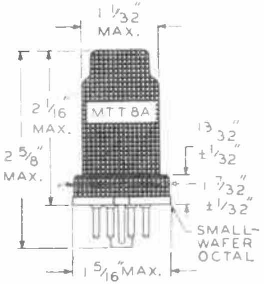
TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

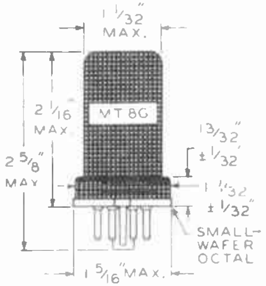
For correlation of TUBE TYPE, ENVELOPE DESIGNATION, & OUTLINE No., see KEY on back of this sheet



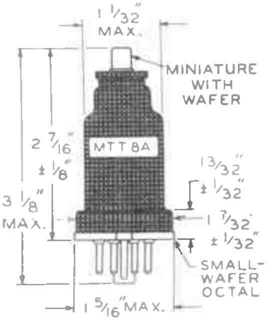
JETEC No.8-5



JETEC No.8-3



JETEC No.8-1

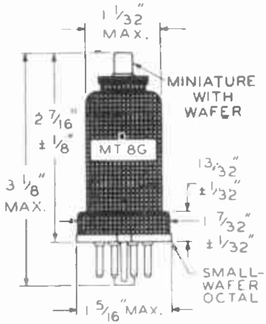


JETEC No.8-4

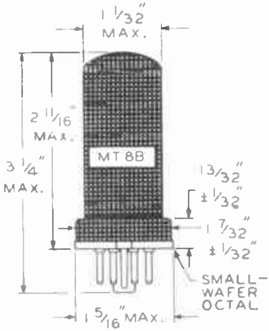
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

OUTLINES—Metal Tubes

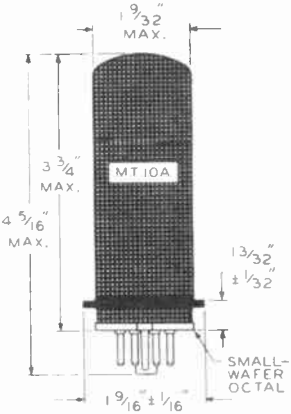
For correlation of
TUBE TYPE, ENVELOPE DESIGNATION, & OUTLINE No.,
see KEY on back of this sheet



JETEC No. 8-



JETEC No. 8-6



JETEC No. 10-1

TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON NEW JERSEY

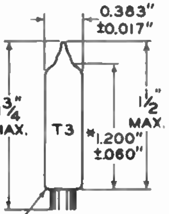
OUTLINES — Metal Tubes

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

OUTLINES—Glass Tubes

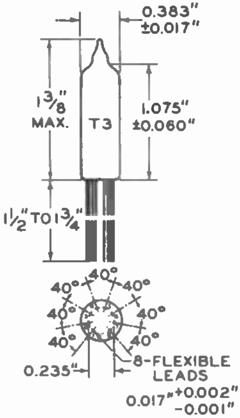
SMALL-BUTTON SUB-MINAR BASE TYPE



* MEASURED FROM BASE SEAT TO BULB-TOP LINE AS DETERMINED BY A RING GAUGE OF .210" I.D.

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

FLEXIBLE-LEAD TYPE

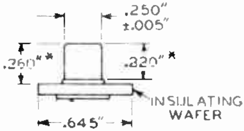


TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

BASES

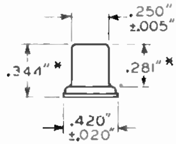
[illegible]

MINIATURE WITH WAFER



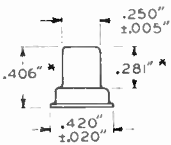
JETEC No. [illegible]1-4
[illegible]

SKIRTED MINIATURE



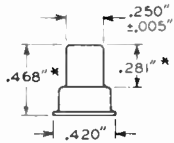
[illegible] No.C1-3
[illegible]

SKIRTED MINIATURE



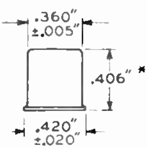
JETEC N[illegible] 1-2
RCA No. 3927

SKIRTED MINIATURE



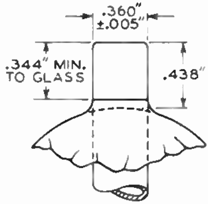
[illegible]TEC No.C1-[illegible]

SMALL



JETEC No.[illegible]1-1
RCA No.39[illegible]7

SMALL WITH TUBULAR SUPPORT



CONNECTOR SHOULD NOT EXERT MORE THAN 7 POUNDS RADIAL COMPRESSION AT ANY POINT AROUND THE CIRCUMFERENCE OF THE CAP.

JETEC No.C1-34
RCA No.3999

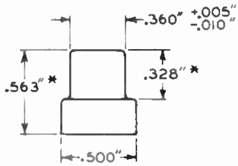
* Add 0.020" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON NEW JERSEY

RCA BASES

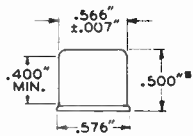
1-TERMINAL TYPES (CAPS)

SKIRTED SMALL



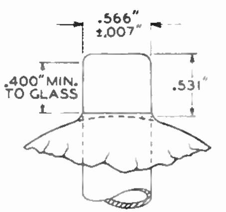
JETEC No. C1-22

MEDIUM



JETEC No. C1-5
RCA No. 3903

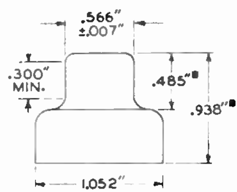
MEDIUM WITH TUBULAR SUPPORT



CONNECTOR SHOULD NOT EXERT MORE THAN 10 POUNDS RADIAL COMPRESSION AT ANY POINT AROUND THE CIRCUMFERENCE OF THE CAP.

JETEC No. C1-39
RCA No. R7162

SKIRTED MEDIUM



JETEC No. C1-14
RCA No. 3980

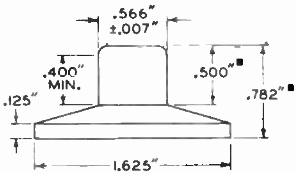
* Add 0.020" for solder on finished tube.
■ Add 0.040" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

BASES

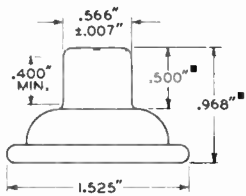
1-TERMINAL TYPES (CAPS)

SKIRTED MEDIUM



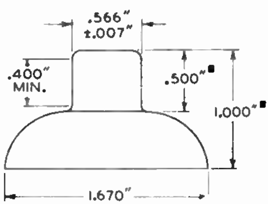
JETEC No.C1-29

SKIRTED MEDIUM WITH ROLLED EDGE



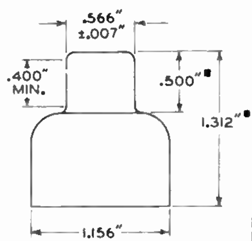
JETEC No.C1-19
RCA No.3940

SKIRTED MEDIUM



JETEC No.C1-27
RCA No.3985

SKIRTED MEDIUM



JETEC No.C1-6
RCA No.3904

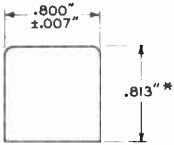
■ Add 0.040" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON NEW JERSEY

BASES

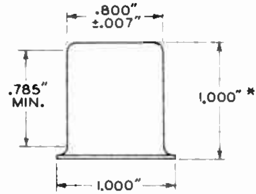
1-TERMINAL TYPES (CAPS)

LARGE



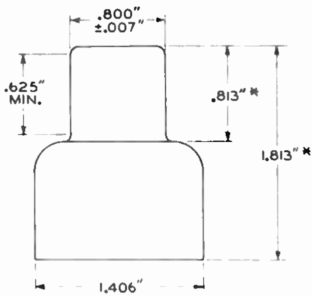
JETEC No.C1-15
RCA No.3917

LARGE



JETEC No.C1-6
RCA No.3910

SKIRTED LARGE



JETEC No. [illegible]1-4
RCA No. [illegible]

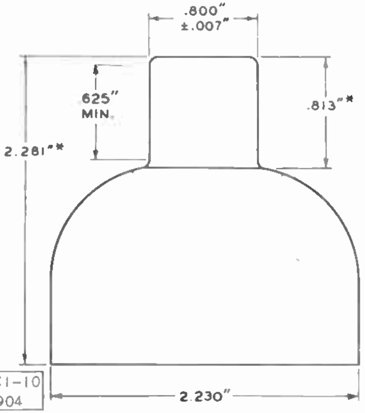
* Add [illegible] for solder on finished base.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

BASES

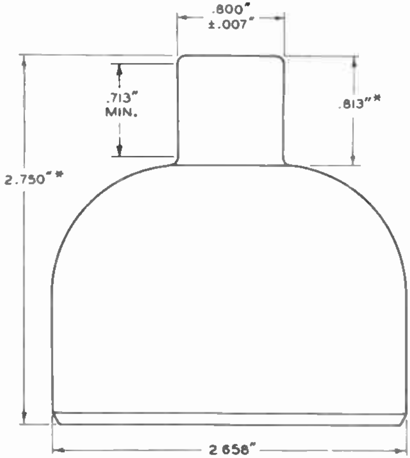
1-TERMINAL TYPES (CAPS)

SKIRTED LARGE



JETEC No. C1-10
RCA No. 1904

SKIRTED LARGE

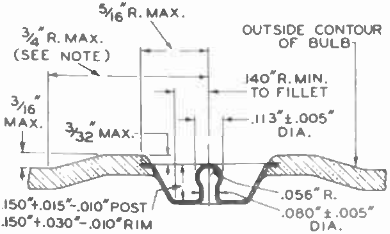


JETEC No. C1-30
RCA No. 1902

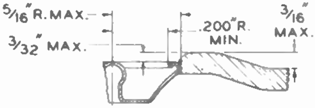
* Add 0.060" for solder on finished tube.

DETAILS OF RECESSED SMALL BALL CAP & BULB ASSEMBLY

JETEC No. J1-22



ALTERNATE EDGE DESIGN



VARIANT SEAL SHAPES

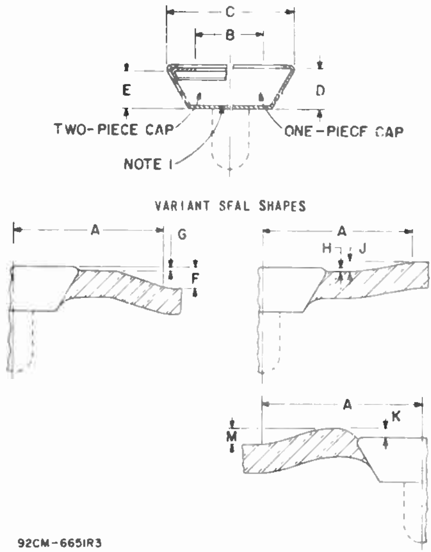
NOTE: PROTRUSION OF GLASS AROUND CAP ABOVE BULB CONTOUR IS LIMITED TO AREA BOUNDED BY CIRCLE CONCENTRIC WITH CAP AXIS AND HAVING RADIUS OF 3/4" MAX.

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
JEDEC No. J1-21



92CM-6651R3

DIMEN-SION	INCHES			MILLIMETERS			NOTES
	Min	Nom	Max	Min	Nom	Max	
A	–	–	[illegible]	–	–	[illegible]	
[illegible]	.307	0.312	[illegible]	7.[illegible]	[illegible]	8.0[illegible]	
[illegible]	–	–	[illegible]	–	–	[illegible]	
[illegible]	[illegible]	–	[illegible]	[illegible]	–	[illegible]	
[illegible]	[illegible]	–	[illegible]	[illegible]	–	[illegible]	
[illegible]	–	–	[illegible]	–	–	[illegible]	
[illegible]	–	–	[illegible]	–	–	[illegible]	
[illegible]	–	–	[illegible]	–	–	[illegible]	
[illegible]	–	–	[illegible]	–	–	1.19	[illegible]
[illegible]	–	–	[illegible]	–	–	[illegible]	
[illegible]	–	–	[illegible]	–	–	[illegible]	

See Notes on reverse side.

Note 1: Connector shall not extend beyond this line. Bottom contour optional.

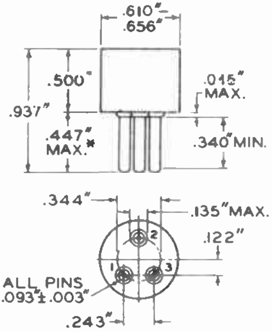
Note 2: Protrusion or depression of glass around cap above bulb contour is limited to areas bounded by circle concentric with cap axis and having radii as shown above.

Note 3: When measured in a plane perpendicular to axis of contact cone.

Note 4: When attaching or detaching the connector the total force required should not exceed eight pounds as applied perpendicular to the plane of the rim of the cap.

Note 5: The angle between plane of the rim of the cap and plane tangent to original contour of bulb at center of cap shall not exceed 10°.

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".

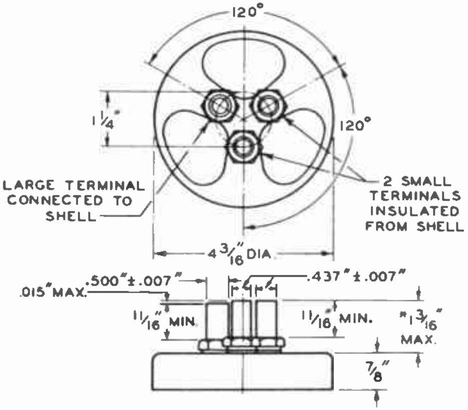
Pin fit in gauge is such that gauge together with supplementary weight totaling 2 pounds will not be lifted when pins are withdrawn.

* Add 0.020" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

BASES

3-TERMINAL TYPES

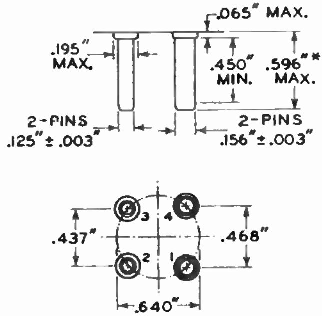


JETEC No. A3-80
RCA No. 3232

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

4-PIN TYPES

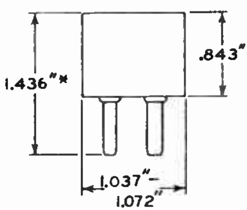
"SMALL 4-PIN"
PIN DIMENSIONS AND ORIENTATION



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 0.4680" ± 0.0005" and the distance between the adjacent 0.1340" diameter pins is 0.4370" ± 0.0005".

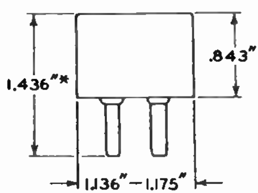
Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

DWARF-SHELL SMALL 4-PIN



JETEC No.A4-26
RCA No.4107

SMALL-SHELL SMALL 4-PIN



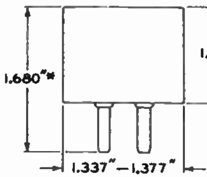
JETEC No.A4-5
RCA No.4108

* Add 0.030" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

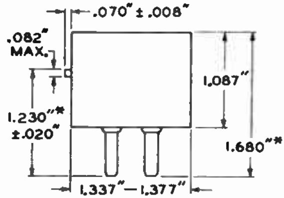
4-PIN TYPES

MEDIUM-SHELL SMALL 4-PIN



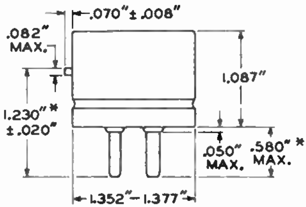
JETEC No. A4-9
RCA No. 4106

MEDIUM-SHELL SMALL 4-PIN WITH BAYONET



JETEC No. A4-10
RCA No. 4102

MEDIUM-METAL-SHELL SMALL 4-PIN WITH BAYONET



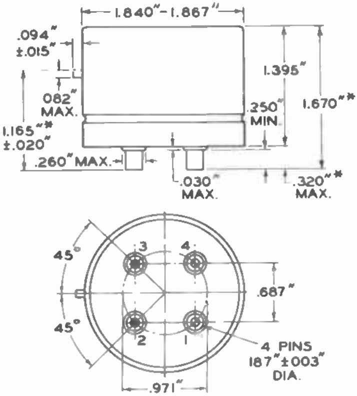
JETEC No. A4-89
RCA No. 4102-M1

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

* Add 0.030" for solder on finished tube.

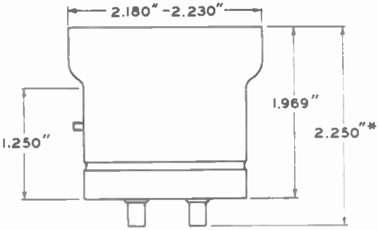
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

MEDIUM-METAL-SHELL JUMBO 4-PIN
WITH BAYONET



JETEC No. A4-29
RCA No. 1839B

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

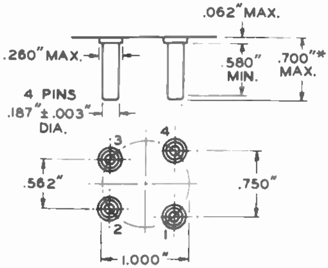


JETEC No. A4-69
RCA No. 4260A

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

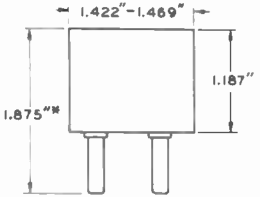
* Add 0.060" for solder on finished tube.

SUPER-JUMBO 4-PIN
PIN DIMENSIONS AND ORIENTATION



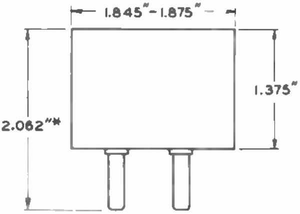
Base-pin positions are held to tolerances such that pin centers may deviate a maximum distance of 0.010" from their true geometric position.

SMALL-SHELL SUPER-JUMBO 4-PIN



JETEC No. A4-15
RCA No. 411

MEDIUM-SHELL SUPER-JUMBO 4-PIN

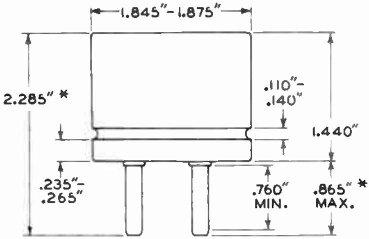


JETEC No. A4-16
RCA No. 412

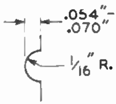
* Add 0.060" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

MEDIUM-METAL-SHELL
SUPER-JUMBO 4-PIN



Detail of Groove



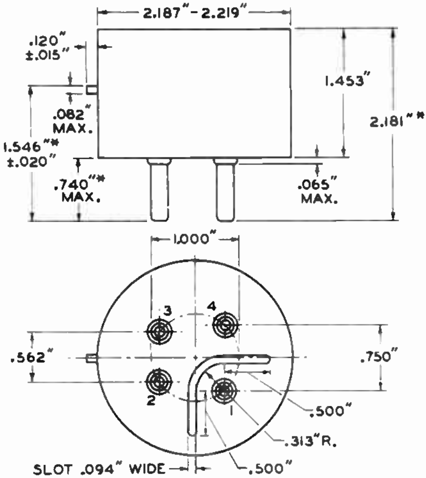
JETEC No. A4-81

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

* Add 0.060" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON NEW JERSEY

LARGE-SHELL SUPER-JUMBO 4-PIN WITH BAYONET



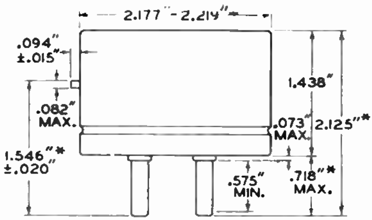
JETEC No. A4-88
RCA No. 3982

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

* Add 0.060" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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



JETEC No. A4-18

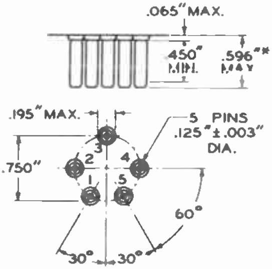
RCA No. 4310

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

* Add 0.060" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

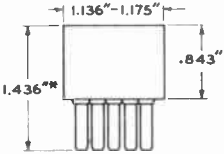
"SMALL 5-PIN"
PIN DIMENSIONS AND ORIENTATION



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".

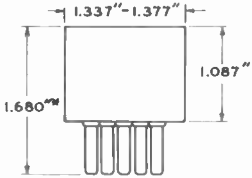
Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

SMALL-SHELL SMALL 5-PIN



JETEC No. A5-6
RCA No. 5108

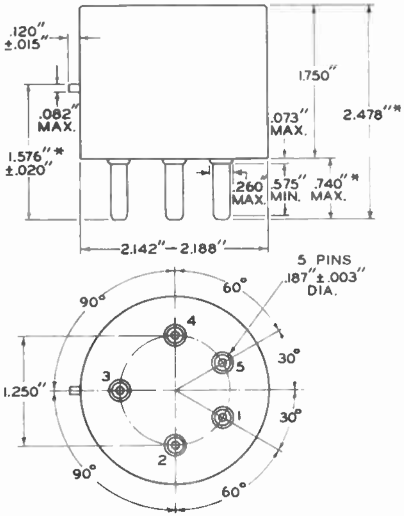
MEDIUM-SHELL SMALL 5-PIN



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.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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

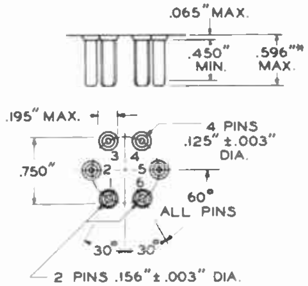
See Tube Type 4-65A

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

BASES

6-PIN TYPES

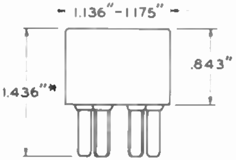
"SMALL 6-PIN"
PIN DIMENSIONS AND ORIENTATION



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".

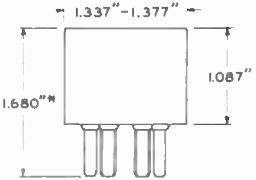
Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

SMALL-SHELL SMALL 6-PIN



JETEC No.A6-7
RCA No.6108

MEDIUM-SHELL SMALL 6-PIN

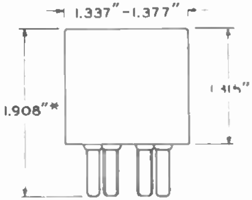


JETEC No.A6-1.
RCA No.61[illegible]6

* Add 0.030" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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

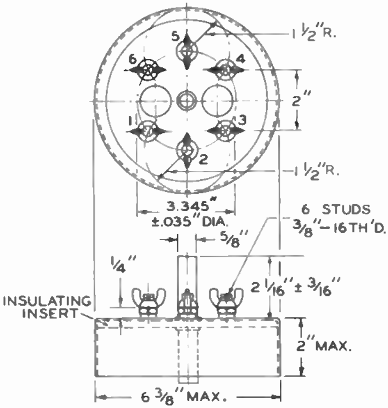
SMALL-SHELL OCTAL 6-PIN
INTERMEDIATE-SHELL OCTAL 6-PIN
SHORT INTERMEDIATE-SHELL OCTAL 6-PIN
SHORT INTERMEDIATE-SHELL OCTAL 6-PIN WITH EXTERNAL BARRIERS
MEDIUM-SHELL OCTAL 6-PIN
SHORT JUMBO-SHELL OCTAL 6-PIN
SMALL-WAFER OCTAL 6-PIN
SMALL-WAFER OCTAL 6-PIN WITH SLEEVE

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

* Add 0.030" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON NEW JERSEY

6-TERMINAL TYPES

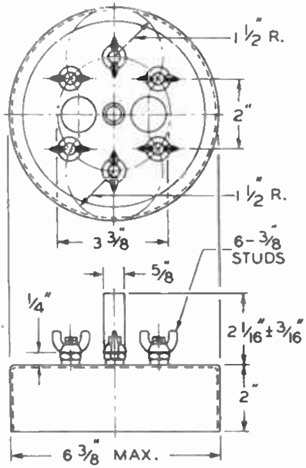


SPACE FOR CONNECTOR BETWEEN WING NUT AND LOCK NUT IS 3/16" MAX.

JETEC No. FO-6
RCA No. 6628

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

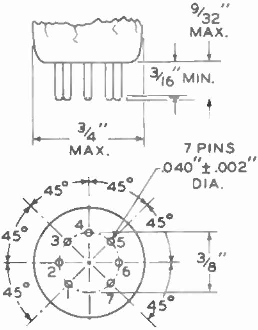
№6628 BASE



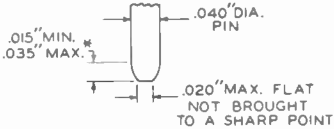
SPACE FOR CONNECTOR BETWEEN WING NUT AND LOCK NUT IS 3/16" MAX.

92CM-4438R2

SMALL-BUTTON MINIATURE 7-PIN



Miniature Base Pin Contour



JETEC No.E7-1

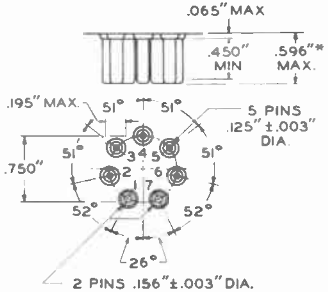
Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from flat-plate gauge (part of gauge JETEC No.GE7-1) having thickness of 1/4" and eight holes with diameters of 0.0520" ± 0.0005" so located on a 0.3750" ± 0.0005" diameter circle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

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

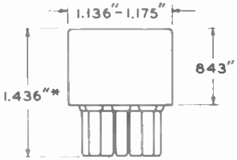
"SMALL 7-PIN"
PIN DIMENSIONS AND ORIENTATION



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

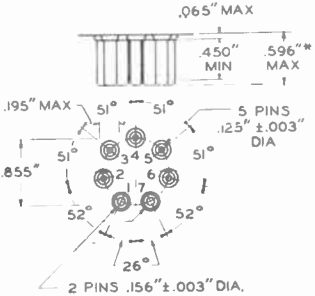


JETEC No.A7-8
RCA No.7108

* Add 0.030" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

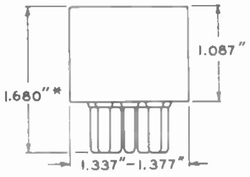
"MEDIUM 7-PIN"
PIN DIMENSIONS AND ORIENTATION



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".

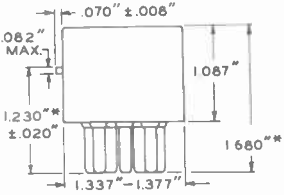
Pin fit in gauge is such that gauge together with supplementary weight totaling 4 pounds will not be lifted when pins are withdrawn.

MEDIUM-SHELL MEDIUM 7-PIN



JETEC No.A7-13
RCA No.7306

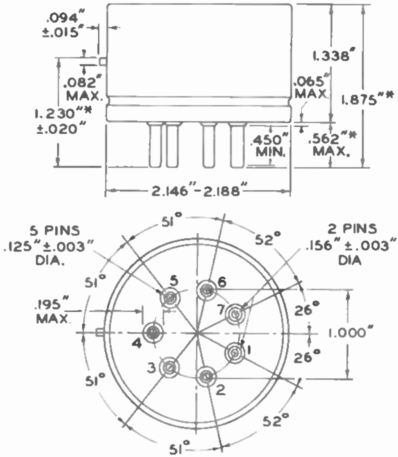
MEDIUM-SHELL MEDIUM 7-PIN WITH BAYONET



JETEC No.A7-14
RCA No.7302

* Add 0.030" for solder on finished tube.

MEDIUM-METAL-SHELL GIANT 7-PIN WITH BAYONET



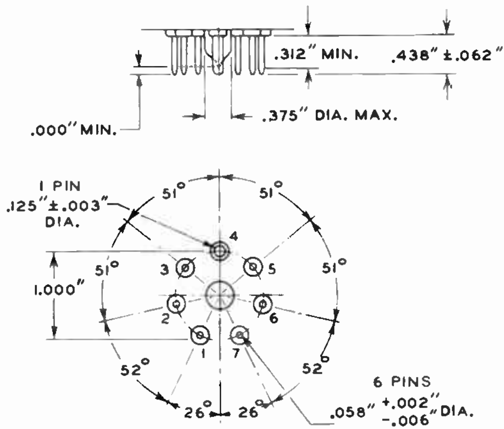
JETEC No.A7-17
RCA No.7609

VENTILATED MEDIUM-METAL-SHELL GIANT 7-PIN

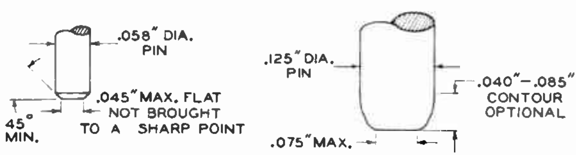
See Tube Type 4E27A/5-125B

* Add 0.060" for solder on finished tube.

"SEPTAR"
PIN DIMENSIONS AND ORIENTATION



Septar Base Pin Contour

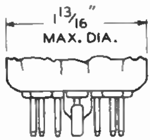


Base-pin positions are held to tolerances such that entire length of pins will without undue force pass into and disengage from flat-plate gauge having thickness of 3/8" and seven holes, one with diameter of 0.1450" ± 0.0005" and six with diameters of 0.0800" ± 0.0005" located on a 1.0000" ± 0.0005" 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.

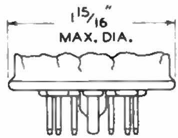
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

MEDIUM-BUTTON SEPTAR 7-PIN



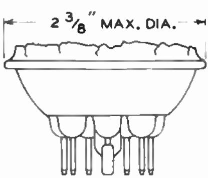
JETEC No. E7-20
RCA No. FSB6014

SMALL-WAFER SEPTAR 7-PIN



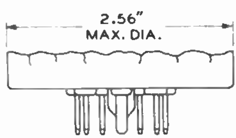
JETEC No. E7-21
RCA No. FSB712

MEDIUM MOLDED-FLARE SEPTAR 7-PIN



JETEC No. E7-2
RCA No. FSB603

JUMBO-BUTTON SEPTAR 7-PIN



JETEC No. E7-46
RCA No. FSB6038

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

7-PIN TYPES

SMALL-SHELL DUODECAL 7-PIN

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

SMALL-BUTTON EIGHTAR 7-PIN

For details of this base, see corresponding SMALL-BUTTON EIGHTAR 8-PIN type

SMALL-SHELL OCTAL 7-PIN

SHORT INTERMEDIATE-SHELL OCTAL 7-PIN

SHORT INTERMEDIATE-SHELL OCTAL 7-PIN WITH EXTERNAL BARRIERS

INTERMEDIATE-SHELL OCTAL 7-PIN

SHORT MEDIUM-SHELL OCTAL 7-PIN WITH EXTERNAL BARRIERS, STYLES A AND B

MEDIUM-SHELL OCTAL 7-PIN

SHORT JUMBO-SHELL OCTAL 7-PIN WITH EXTERNAL BARRIERS

SMALL-WAFER OCTAL 7-PIN

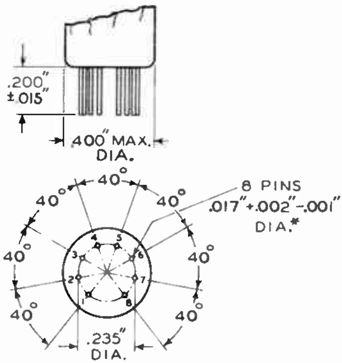
SMALL-WAFER OCTAL 7-PIN WITH SLEEVE

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

SMALL RADIAL 7-PIN

See OUTLINES--Glass Tubes

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 JETEC No.GE8-1. This gauge contains a flat-plate section 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".

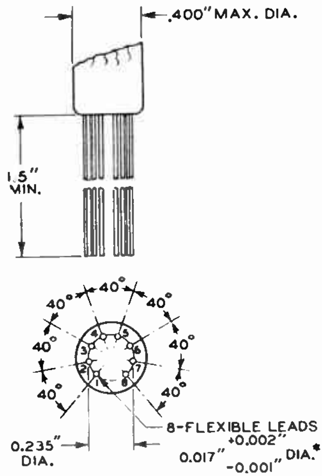
The design of the socket should be such that circuit wiring can not impress lateral strains through the socket contacts on the base pins. The point of bearing of the contacts on the base pins should not be closer than 0.050" from the bottom of the seated tube.

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

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

BASES

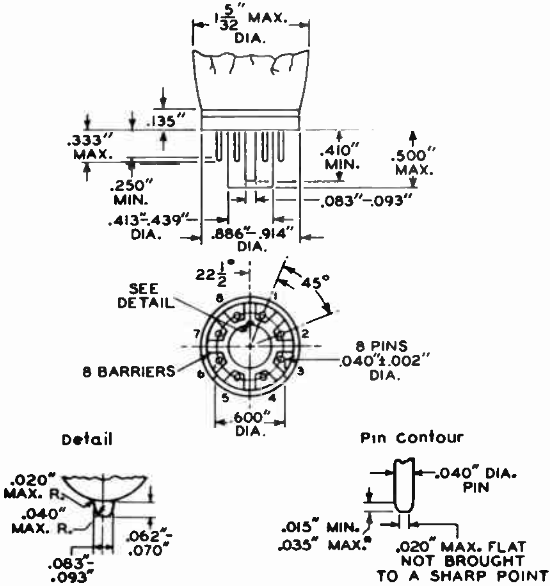
8-LEAD TYPES



JETEC No. E8-10

* The specified lead diameter applies only in the zone between 0.050" and 0.250" from the base seat. Between 0.250" and 1.500", a maximum diameter of 0.021" is held. Outside of these zones, the lead diameter is not controlled.

SMALL-BUTTON NEOEIGHTAR



No. of Pins	*Pins*	*JEDEC No.*	*RCA No.#*
8-Pin	1,2,3,4,5,6,7,8	88-218	80001
7-Pin■	1,2,3,4, 6,7,8	87-208	80001
7-Pin▲	2,3,4,5,6,7,8	87-219	80001

Base-pin positions are held to tolerances such that the base will fit a flat-plate gauge having a thickness of 3/8" and eight equally spaced holes of 0.0550" ± 0.0005" diameter located on a 0.6000" ± 0.0005" diameter circle. The gauge is also provided with a center hole to provide 0.010" diametric clearance for the lug and key. Pin fit in the gauge shall be such that the entire length of pins will, without undue force, enter into and disengage from the gauge.

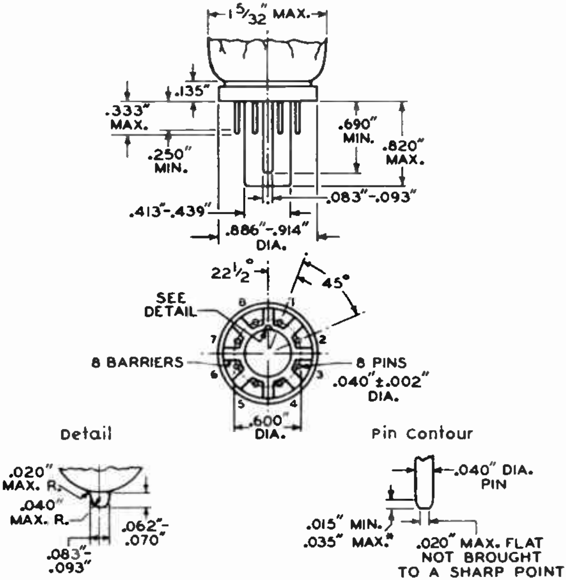
* This dimension around the periphery of any individual pin may vary within the limits shown.

This number applies to wafer only.

■ Arrangement 1.

▲ Arrangement 2.

SMALL-BUTTON EIGHTAR



No. of Pins	Pins	JEDEC No.	RCA No.#
8-Pin	1,2,3,4,5,6,7,8	B8-181	80000
7-Pin■	2,3,4,5,6,7,8	B7-182	B0000
7-Pin▲	1,2,3,4, 6,7,8	B7-183	B0000

Base-pin positions are held to tolerances such that the base will fit a flat-plate gauge having a thickness of 3/8" and eight equally spaced holes of 0.0550" ± 0.0005" diameter located on a 0.6000" ± 0.0005" diameter circle. The gauge is also provided with a center hole to provide 0.010" diametric clearance for the lug and key. Pin fit in the gauge shall be such that the entire length of pins will, without undue force, enter into and disengage from the gauge.

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

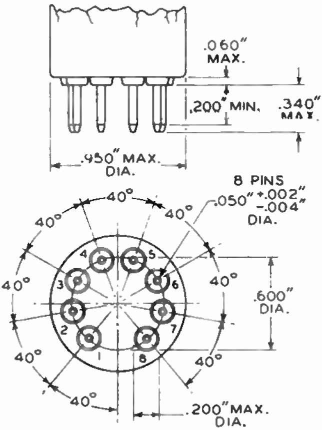
\# This number applies to wafer only.

■ Arrangement 1.

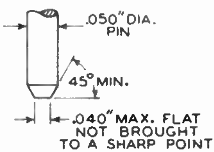
▲ Arrangement 2.

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

SMALL-BUTTON NEODITETRAR 8-PIN



Neoditetrar-Base Pin Contour

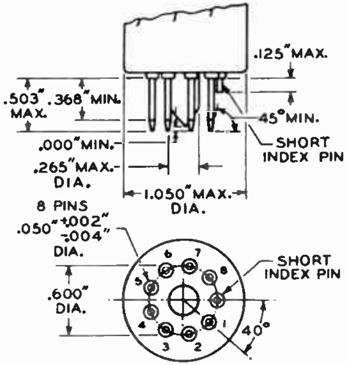


JEDEC No. E8-49
RCA No. FSB6006*

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".

* This number applies to stem only.

SMALL-BUTTON DITETRAR 8-PIN



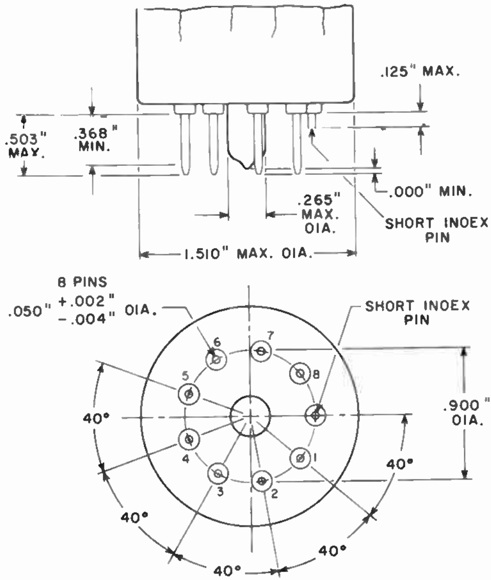
JEDEC No. E8-11	
RCA No.	FSB675#
	FSB6015#

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.

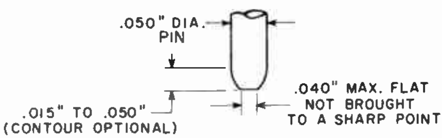
This number applies to stem only.

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

SMALL-BUTTON SUPERDITETRAR
Pin Dimensions and Orientation



Superditetrar-Base-Pin Contour



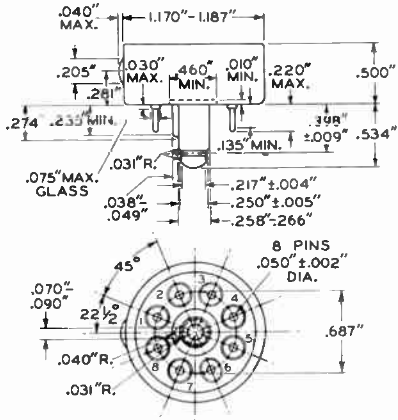
JEDEC No. E8-78
RCA No. FSB6055#

Base-pin positions are held to tolerances such that entire length of pins will, without undue force, pass into and disengage from a flat-plate gauge having a thickness of

This number applies to stem only.

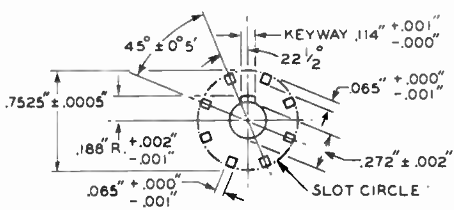
1/4" and nine holes with diameters of 0.0700" ± 0.0005" so located on a 0.9000" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.3078" ± 0.0005". Gauge is also provided with a hole having diameter of 0.300" ± 0.001" concentric with the pin circle.

LOCK-IN 8-PIN

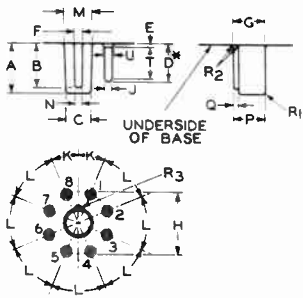


JETEC No. D8-1

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"

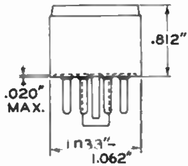
Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No.GB8-1) having thickness of 1/4" and eight holes with diameters of 0.1030" ±0.0005" so located on a 0.6870" ±0.0005" diameter circle that the distance along the chord between any two adjacent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

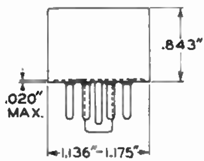
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DWARF-SHELL OCTAL



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

SMALL-SHELL OCTAL



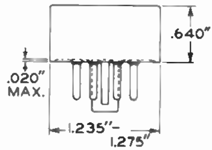
No. of Pins	*Pins*	*JEDEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	B8-1	8529
7-Pin	1,2,3,4,5, 7,8	B7-2	7529
6-Pin	1,2,3, 5, 7,8	B6-3	6529
5-Pin	1,2, 4, 6, 8	B5-5	5529

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

Bases

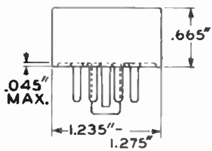
8-Pin Types

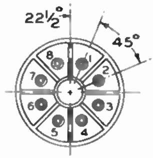
SHORT INTERMEDIATE-SHELL OCTAL



No. of Pins	*Pins*	*JEDEC 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



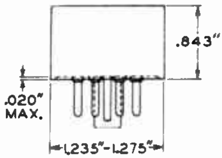


No. of Pins	*Pins*	*JEDEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	B8-58	8565
7-Pin[a]	1,2,3,4,5, 7,8	B7-59	7565
7-Pin[b]	1,2,3, 5,6,7,8	B7-211	-
6-Pin[a]	1,2,3, 5, 7,8	B6-60	6565
6-Pin[b]	2,3,4,5, 7,8	B6-84	6765
5-Pin[a]	1,2, 4, 6, 8	B5-62	5565
5-Pin[b]	2,3, 5, 7,8	B5-85	5765
5-Pin[c]	2, 4,5, 7,8	B5-187	-

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

[a] Arrangement 1.
[b] Arrangement 2.
[c] Arrangement 3.

INTERMEDIATE-SHELL OCTAL

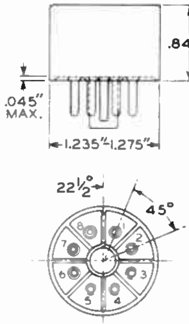


No. of Pins	*Pins*	*JEDEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	B8-6	8537
7-Pin[a]	1,2,3,4,5, 7,8	B7-7	7537
7-Pin[b]	1,2,3, 5,6,7,8	B7-166	39100
6-Pin[a]	1,2,3, 5, 7,8	B6-8	6537
6-Pin[b]	2,3,4,5, 7,8	B6-81	6737
5-Pin[a]	1,2, 4, 6, 8	B5-10	5537
5-Pin[b]	2,3, 5, 7,8	B5-82	5737

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

[a] Arrangement 1.
[b] Arrangement 2.

INTERMEDIATE-SHELL OCTAL
WITH EXTERNAL BARRIERS

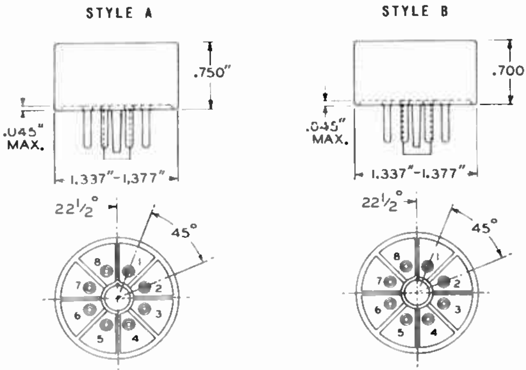


No. of Pins	*Pins*	*JEDEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	88-142	8566
7-Pin	1,2,3,4,5, 7,8	87-143	7566
6-Pin[a]	1,2,3, 5, 7,8	86-144	6566
6-Pin[b]	2,3,4,5, 7,8	86-145	6766
6-Pin[c]	2,3, 5,6,7,8	86-229	39111
5-Pin[a]	1,2, 4, 6, 8	85-146	5566
5-Pin[b]	2,3, 5, 7,8	85-147	5766

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

[a] Arrangement 1.
[b] Arrangement 2.
[c] Arrangement 3.

SHORT MEDIUM-SHELL OCTAL
WITH EXTERNAL BARRIERS

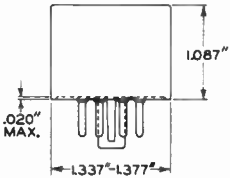


No. of Pins	Pins	Style	JEDEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	A	88-110	39081
8-Pin	1,2,3,4,5,6,7,8	B	88-118	8564
7-Pin[a]	1,2,3,4,5, 7,8	A	87-111	–
7-Pin[a]	1,2,3,4,5, 7,8	B	87-119	7564
7-Pin[b]	1,2,3, 5,6,7,8	B	87-227	39113
7-Pin[c]	1,2,3,4, 6,7,8	B	87-235	–
6-Pin[a]	1,2,3, 5, 7,8	A	86-112	–
6-Pin[a]	1,2,3, 5, 7,8	B	86-120	6564
6-Pin[b]	2,3,4,5, 7,8	A	86-148	–
6-Pin[b]	2,3,4,5, 7,8	B	86-122	6764
5-Pin[a]	1,2, 4, 6, 8	A	85-113	–
5-Pin[a]	1,2, 4, 6, 8	B	85-121	5564
5-Pin[b]	2,3, 5, 7,8	A	85-149	–
5-Pin[b]	2,3, 5, 7,8	B	85-123	5764
5-Pin[c]	1,2,3, 5, 7	A	85-234	–
5-Pin[c]	1,2,3, 5, 7	B	85-239	39116
5-Pin[d]	2, 4,5, 7,8	B	85-190	39110

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

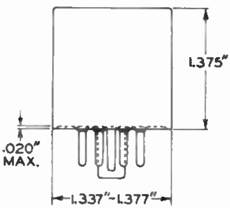
[a] Arrangement 1.
[b] Arrangement 2.
[c] Arrangement 3.
[d] Arrangement 4.

MEDIUM-SHELL OCTAL



No. of Pins	Pins	JEDEC 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[a]	1,2, 4, 6, 8	B5-15	5533
5-Pin[b]	2,3, 5, 7,8	B5-224	5733

LONG MEDIUM-SHELL OCTAL

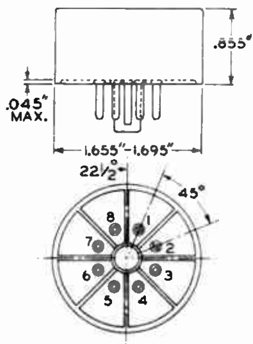


No. of Pins	Pins	JEDEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	B8-65	8545
5-Pin	2,3, 5, 7,8	B5-80	5545

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

[a] Arrangement 1.
[b] Arrangement 2.

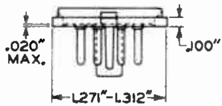
SHORT JUMBO-SHELL OCTAL
WITH EXTERNAL BARRIERS

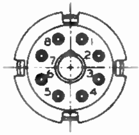


No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	B8-71	8556
7-Pin	1,2,3,4,5, 7,8	B7-72	7556
6-Pin	1,2,3, 5, 7,8	B6-73	6556
5-Pin	1,2, 4, 6, 8	B5-74	5556

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

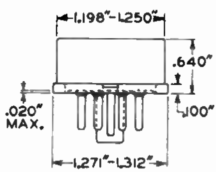
SMALL-WAFER OCTAL





No. of Pins	*Pins*	*JETEC No.*	*RCA No.*	
8-Pin	1,2,3,4,5,6,7,8	88-21	8527	8540
7-Pin	1,2,3,4,5, 7,8	87-22	7527	7540
6-Pin	1,2,3, 5, 7,8	86-23	6527	6540
5-Pin	1,2, 4, 6, 8	85-25	5527	5540

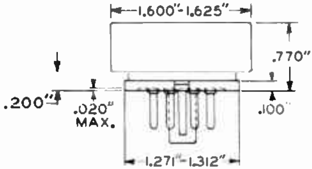
SMALL-WAFER OCTAL
WITH SLEEVE



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	88-44	M88527-602

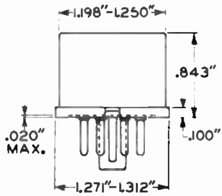
For other dimensions of above bases, see first page of the "Octal" series

SMALL-WAFER OCTAL
WITH "770" SLEEVE



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*	
8-Pin	1,2,3,4,5,6,7,8	B8-150	MB8540-7	MB8527-603
7-Pin	1,2,3,4,5, 7,8	B7-151	MB7540-4	-
6-Pin ■	1,2,3, 5, 7,8	B6-152	MB6540-5	-
6-Pin ▲	2,3,4,5, 7,8	B6-153	MB6740-1	-
5-Pin ■	1,2, 4, 6, 8	B5-154	MB5540-1	-
5-Pin ▲	2,3, 5, 7,8	B5-155	MB5740-1	-

SMALL-WAFER OCTAL
WITH "843" SLEEVE

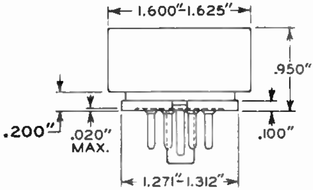


No. of Pins	*Pins*	*JETEC No.*	*RCA No.*	
8-Pin	1,2,3,4,5,6,7,8	B8-26	MB8527-1	MB8540-3
7-Pin	1,2,3,4,5, 7,8	B7-27	MB7527-1	MB7540-1
6-Pin	1,2,3, 5, 7,8	B6-28	MB6527-1	MB6540-3
5-Pin	1,2, 4, 6, 8	B5-30	MB5527-1	MB5540-2

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

■ Arrangement 1.
▲ Arrangement 2.

SMALL-WAFER OCTAL
WITH "950" SLEEVE



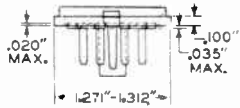
No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	B8-191	MB8540-8
7-Pin	1,2,3,4,5, 7,8	B7-192	MB7540-5
6-Pin■	1,2,3, 5, 7,8	B6-193	MB6540-6
6-Pin▲	2,3,4,5, 7,8	B6-194	MB6740-2
5-Pin■	1,2, 4, 6, 8	B5-195	MB5540-3
5-Pin▲	2,3, 5, 7,8	B5-196	MB5740-2

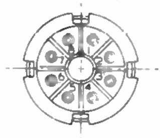
For other dimensions of above base, see first page of the "Octal" series

■ Arrangement 1.
▲ Arrangement 2.

8-PIN TYPES

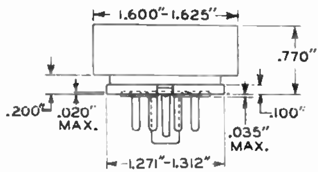
SMALL-WAFER OCTAL
WITH EXTERNAL BARRIERS





No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	B8-67	8559
7-Pin	1,2,3,4,5, 7,8	B7-68	7559
6-Pin■	1,2,3, 5, 7,8	B6-69	6559
6-Pin▲	2,3,4,5, 7,8	B6-205	6759
5-Pin■	1,2, 4, 6, 8	B5-70	5559
5-Pin▲	2,3, 5, 7,8	B5-206	5759

SMALL-WAFER OCTAL
WITH EXTERNAL BARRIERS AND "770" SLEEVE

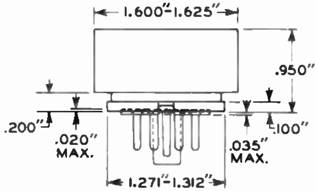


No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	B8-159	MB8559-2
7-Pin	1,2,3,4,5, 7,8	B7-160	MB7559-1
6-Pin■	1,2,3, 5, 7,8	B6-161	MB6559-1
6-Pin▲	2,3,4,5, 7,8	B6-162	MB6759-1
5-Pin■	1,2, 4, 6, 8	B5-163	MB5559-1
5-Pin▲	2,3, 5, 7,8	B5-164	MB5759-1

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

■ Arrangement 1.
▲ Arrangement 2.

SMALL-WAFER OCTAL
WITH EXTERNAL BARRIERS AND "950" SLEEVE

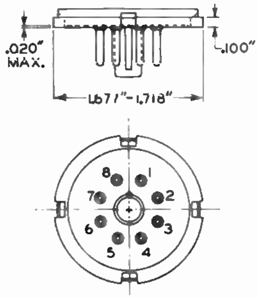


No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	B8-197	MB8559-4
7-Pin	1,2,3,4,5, 7,8	B7-198	MB7559-2
6-Pin■	1,2,3, 5, 7,8	B6-199	MB6559-2
6-Pin▲	2,3,4,5, 7,8	B6-200	MB6759-2
5-Pin■	1,2, 4, 6, 8	B5-201	MB5559-2
5-Pin▲	2,3, 5, 7,8	B5-202	MB5759-2

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

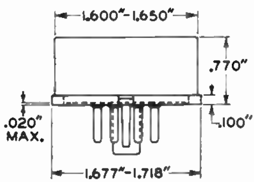
■ Arrangement 1.
▲ Arrangement 2.

LARGE-WAFER OCTAL



No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	88-32	8534

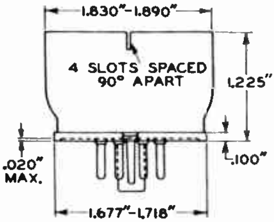
LARGE-WAFER OCTAL
WITH SLEEVE



No. of Pins	Pins	JETEC No.	RCA No.
8-Pin	1,2,3,4,5,6,7,8	B8-86	M88534-601

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

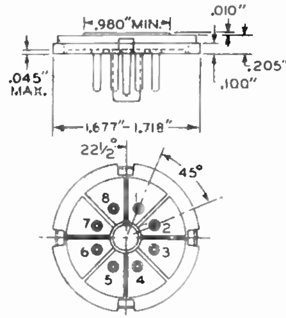
LARGE-WAFER OCTAL
WITH FLARED SLEEVE



No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
8-Pin	1,2,3,4,5,6,7,8	88-188	M88534-600

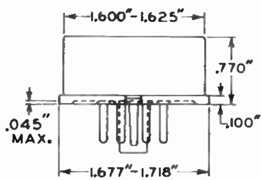
For other dimensions, see first page of the "Octal" series

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
7-Pin	1,2,3,4,5, 7,8	B7-95	7554
6-Pin	1,2,3, 5, 7,8	B6-96	6554
5-Pin	1,2, 4, 6, 8	B5-97	5554

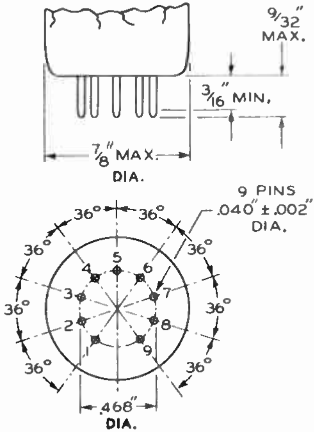
LARGE-WAFER OCTAL
WITH EXTERNAL BARRIERS AND SLEEVE



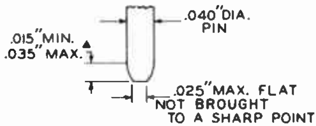
No. of Pins	Pins	JETEC No.	RCA No.	
8-Pin	1,2,3,4,5,6,7,8	B8-98	MB8554-1	MB8554-600
7-Pin	1,2,3,4,5, 7,8	B7-99	MB7554-1	-
6-Pin	1,2,3, 5, 7,8	B6-100	MB6554-1	-
5-Pin	1,2, 4, 6, 8	B5-101	MB5554-2	-

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

SMALL-BUTTON NOVAL 9-PIN
Pin Dimensions and Orientation



Noval-Base-Pin Contour



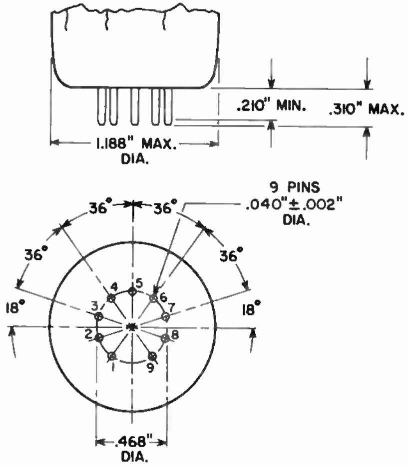
JEDEC No. E9-1
RCA No. FSD169

Base-pin positions are held to tolerances such that entire length of pins will, without undue force, pass into and disengage from gauge JEDEC 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".

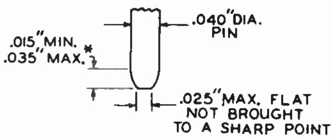
The design of the socket should be such that circuit wiring can not impress lateral strains through the socket contacts on the base pins. The point of bearing of the contacts on the base pins should not be closer than 1/8" from the bottom of the seated tube.

* This dimension around the periphery of any individual pin may vary within the limits shown. The surface of the pin is convex or conical in shape and not brought to a sharp point.

LARGE-BUTTON NEONOVAL 9-PIN
Pin Dimensions and Orientation



Neonoval-Base-Pin Contour



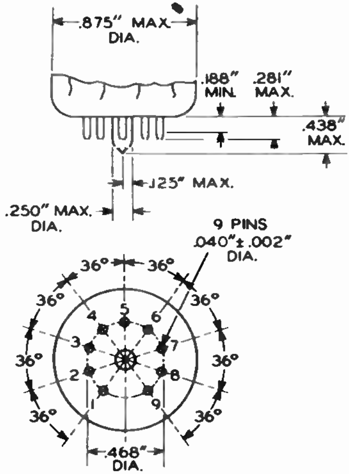
JEOEC No. E9-68
RCA No. FS0171

Base-pin positions are held to tolerances such that entire length of pins will, without undue force, pass into and disengage from gauge JEOEC No. GE9-4. 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".

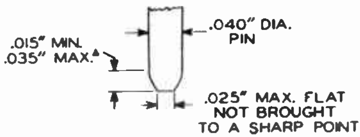
The design of the socket should be such that circuit wiring can not impress lateral strains through the socket contacts on the base pins. The point of bearing of the contacts on the base pins should not be closer than 1/8" from the bottom of the seated tube.

* This dimension around the periphery of any individual pin may vary within the limits shown. The surface of the pin is convex or conical in shape and not brought to a sharp point.

SMALL-BUTTON NINAR 9-PIN
Pin Dimensions and Orientation



Ninar-Base-Pin Contour



JEDEC No.E9-37
RCA No.FSB6047

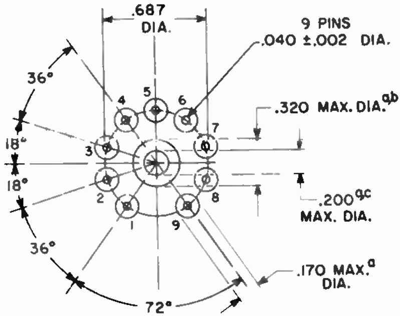
Base-pin positions are held to tolerances such that entire length of pins will, without undue force, pass into and disengage from gauge JEDEC No.GE9-2. This gauge contains a flat-plate section having thickness of 0.250" and ten holes with diameters of 0.0520" ± 0.0005" so located on a 0.4680" ± 0.0005" diameter circle that the distance along the chord between any two adjacent hole centers is 0.1446" ± 0.0005". Gauge is also provided with a hole 0.281" minimum diameter concentric with the pin circle.

▲ This dimension around the periphery of any individual pin may vary within the limits shown. The surface of the pin is convex or conical in shape and not brought to a sharp point.

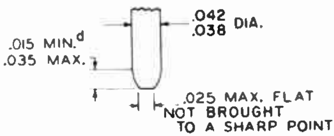
SMALL-BUTTON NINAR 9-PIN (CONT'D)

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.

NOVAR
Pin Dimensions and Orientation



Novar-Base-Pin Contour



92CS-11128R1

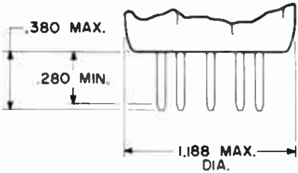
DIMENSIONS IN INCHES

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 a thickness of 0.350" and ten holes with diameters of 0.0520" ± 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 0.2123" ± 0.0005". Gauge is also provided with a hole 0.330" + 0.005" - 0.000" diameter concentric with the pin circle.

[a] This dimension applies only to JEDEC Base Nos. E9-88 and E9-89.
[b] Limit of exhaust tube fillet diameter.
[c] Exhaust tube maximum diameter.
[d] This dimension around the periphery of any individual pin may vary within the limits shown. The surface of the pin is convex or conical in shape and not brought to a sharp point.

TOP EXHAUST NOVAR

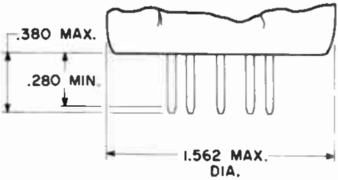
Small-Button Base



JEDEC No. E9-75
RCA No. FSE36

Fits Gauge
JEDEC No. GE9-5

Large-Button Base

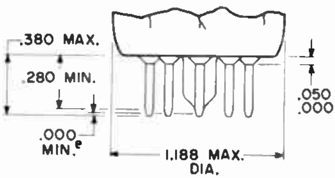


JEDEC No. E9-76
RCA No. FSE22A

Fits Gauge
JEDEC No. GE9-6

BOTTOM EXHAUST NOVAR

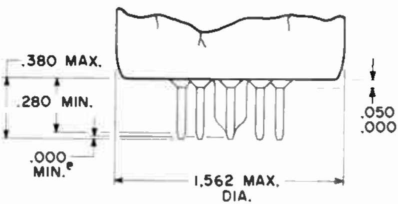
Small-Button Base



JEDEC No. E9-89
RCA No. FSE43G

Fits Gauge
JEDEC No. GE9-5

Large-Button Base



JEDEC No. E9-88
RCA No. FSE43C

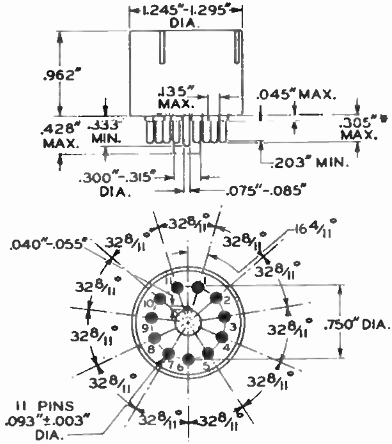
Fits Gauge
JEDEC No. GE9-6

92CM-11300R1

DIMENSIONS IN INCHES

[e] The exhaust tip shall not extend beyond the plane of the base pin ends.

SMALL-SHELL NEOSUBMAGNAL 11-PIN
Pin Dimensions and Orientation



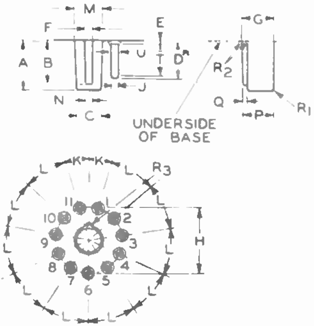
JEDEC No.B11-104
RCA No.11442

Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JEDEC Group 2, 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 0.213" ± 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



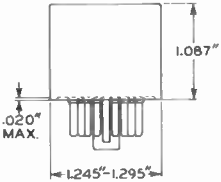
	Min.	Center	Max.		Min.	Center	Max.
A	.550"	.560"	.570"	L	–	32-8/11°	–
B	.490"	.500"	.510"	M	.305"	.312"	.317"
C	.300"	.308"	.315"	N	.075"	.080"	.085"
D	.427"	.437"	.447"	P	.343"	.353"	.363"
E	–	–	.050"	Q	.040"	.047"	.055"
F	.085"	.090"	.095"	R_1	–	.031"	–
G	.352"	.362"	.372"	R_2	–	–	.050"
H	–	.750"	–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

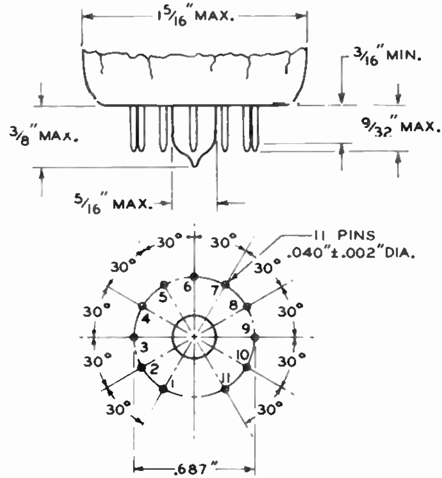


No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
11-Pin	1,2,3,4,5,6,7,8,9,10,11	B11-88	11344

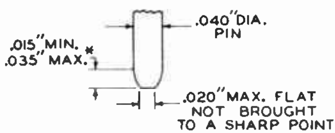
For other dimensions, see first page of the "Submagnal" series

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

SMALL-BUTTON UNIDEKAR 11-PIN



Unidekar Base Pin Contour



JETEC No. E11-22
RCA No. FS86019

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 twelve holes with diameters of 0.0520" ± 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 0.1778" ± 0.0005". Gauge is also provided with a hole 0.3750" ± 0.0100" concentric with the pin circle.

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

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

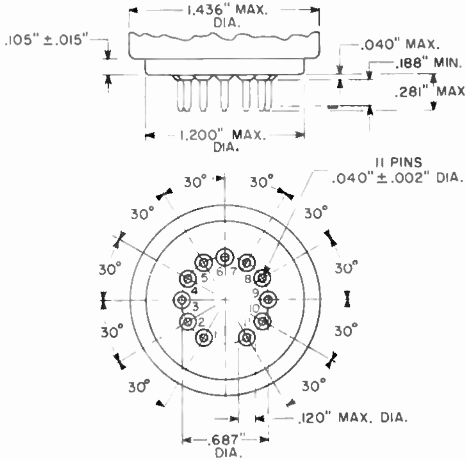
SMALL-BUTTON UNIDEKAR 11-PIN (CONT'D)

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.

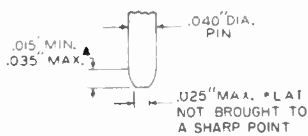
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

LARGE-WAFER ELEVENAR 11-PIN WITH RING

Pin Dimensions and Orientation



Elevenar-Base-Pin Contour

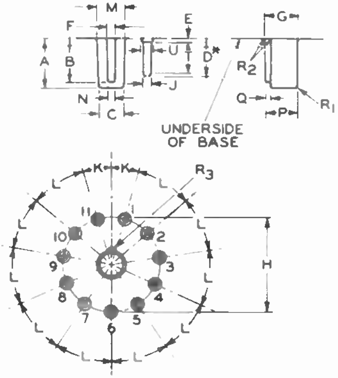


JEDEC No. E11-81

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 (JEDEC No. GE11-1) having a thickness of 0.250" and twelve holes with diameters of 0.0520" ± 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 0.1778" ± 0.0005". Gauge is also provided with a hole 0.3750" ± 0.0005" diameter concentric with the pin circle.

▲ This dimension around the periphery of any individual pin may vary within the limits shown. The surface of the pin is convex or conical in shape and not brought to a sharp point.

"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.

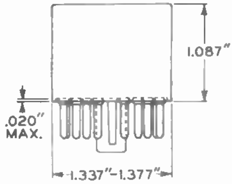
* Add 0.030" for solder on finished tube.

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

BASES

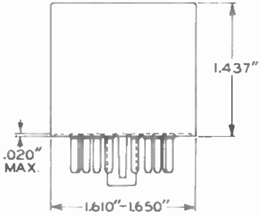
11-PIN TYPES

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



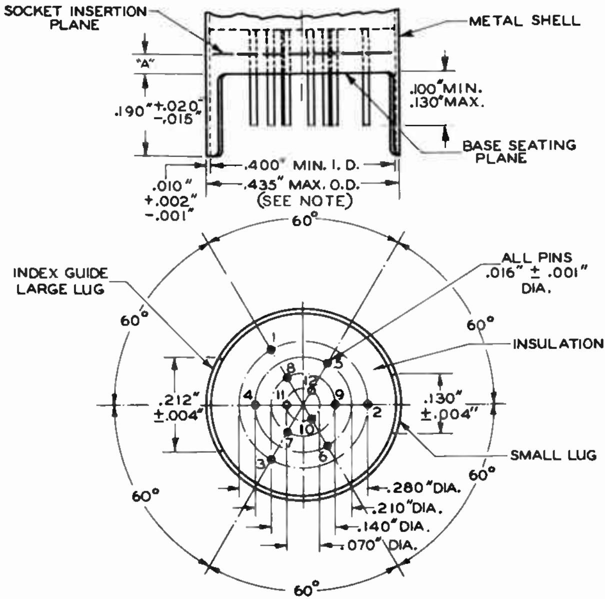
No. of Pins	Pins	JETEC No.	RCA No.
11-Pin	1,2,3,4,5,6,7,8,9,10,11	B11-66	11248

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

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

MEDIUM CERAMIC-WAFER TWELVAR BASE

Pin Dimensions and Orientation and Index Guide



NOTE: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG THE 0.190" LUG LENGTH.

No. of Pins	*Pins*	*Dimension "A" Max.*	*JEDEC No.*	*RCA No.*
12 - Pin	1,2,3,4,5,6,7,8,9,10,11,12	0.040"	E12-64	-
7 - Pin[a]	1, 3, 5,6,7, 10, 12	0.020"	E7-77	-
5 - Pin[b]	2, 4, 8, 10, 12	0.040"	E5-79	-
5 - Pin[c]	2, 4, 8, 10, 12	0.040"	E5-65	-

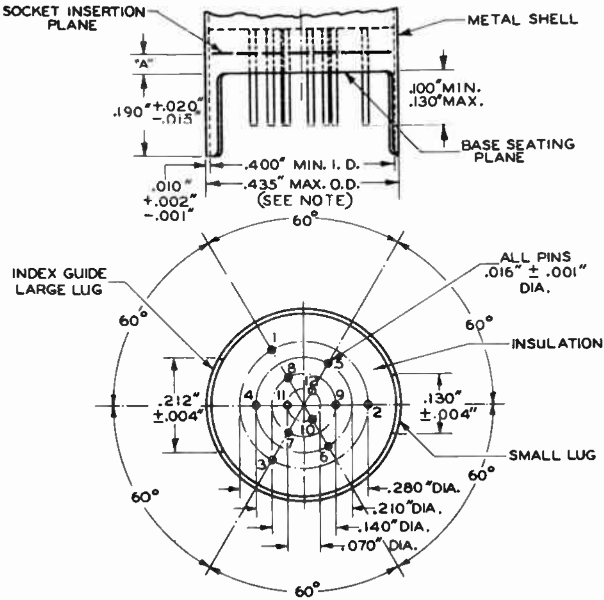
[a] Pins 2,4,8,9 are cut off to a length such that their ends do not touch the socket insertion plane. Pin 11 is omitted.

[b] Pin 7 is cut off to a length such that its end does not touch the socket insertion plane. Pins 1,3,5,6,9,11 are omitted.

[c] Pins 1,3,5,6,7,9 are cut off to a length such that their ends do not touch the socket insertion plane. Pin 11 is omitted.

Base-pin positions and lug positions shall be held to tolerances such that entire length of pins and lugs will without undue force pass into and disengage from flat-plate gauge (JEDEC No.GE12-5) having thickness of 0.250" and twelve holes of 0.0350" ± 0.0005" diameter located on four concentric circles as follows: Three holes located on 0.2800" ± 0.0005", three holes located on 0.2100" ± 0.0005", three holes located on 0.1400" ± 0.0005", three holes located on 0.0700" ± 0.0005" diameter circles at specified angles with a tolerance of ± 0.08° for each angle. In addition, gauge provides for two curved slots with chordal lengths of 0.2270" ± 0.0005" and 0.1450" ± 0.0005" located on 0.4200" ± 0.0005" diameter circle concentric with pin circles at 180° ± 0.08° and having a width of 0.0230" ± 0.0005".

MEDIUM CERAMIC-WAFER TWELVAR BASE
Pin Dimensions and Orientation and Index Guide



NOTE: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG THE 0.190" LUG LENGTH.

No. of Pins	Pins	Dimension "A" Max.	JEDEC No.	RCA No.
12 - Pin	1,2,3,4,5,6,7,8,9,10,11,12	0.040"	E12-64	-
7 - Pin[a]	1,2, 4, 6,7, 10, 12	0.040"	E7-83	-
7 - Pin[b]	1, 3, 5,6,7, 10, 12	0.020"	E7-77	-
5 - Pin[c]	2, 4, 8, 10, 12	0.040"	E5-79	-
5 - Pin[d]	2, 4, 8, 10, 12	0.040"	E5-65	-

[a] Pins 3,5,8,9 are of a length such that their ends do not touch the socket insertion plane. Pin 11 is omitted.

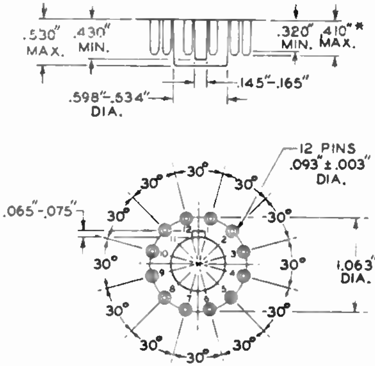
[b] Pins 2,4,8,9 are of a length such that their ends do not touch the socket insertion plane. Pin 11 is omitted.

[c] Pin 7 is of a length such that its end does not touch the socket insertion plane. Pins 1,3,5,6,9,11 are omitted.

[d] Pins 1,3,5,6,7,9 are of a length such that their ends do not touch the socket insertion plane. Pin 11 is omitted.

Base-pin positions and lug positions shall be held to tolerances such that entire length of pins and lugs will without undue force pass into and disengage from flat-plate gauge (JEDEC No. GE12-5) having thickness of 0.250" and twelve holes of 0.0350" ± 0.0005" diameter located on four concentric circles as follows: Three holes located on 0.2800" ± 0.0005", three holes located on 0.2100" ± 0.0005", three holes located on 0.1400" ± 0.0005", three holes located on 0.0700" ± 0.0005" diameter circles at specified angles with a tolerance of ± 0.08° for each angle. In addition, gauge provides for two curved slots with chordal lengths of 0.2270" ± 0.0005" and 0.1450" ± 0.0005" located on 0.4200" ± 0.0005" diameter circle concentric with pin circles at 180° ± 0.08° and having a width of 0.0230" ± 0.0005".

"DUODECAL"
PIN DIMENSIONS AND ORIENTATION AND INDEX GUIDE

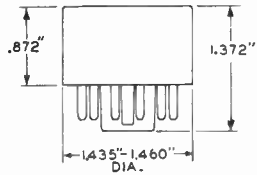


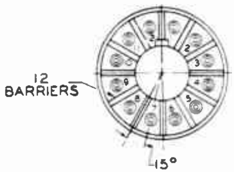
Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No.GB12-1) having thickness of 1/4" and twelve holes with diameters of 0.1030" ± 0.0005" so located on a 1.0630" ± 0.0005" diameter circle that the distance along the chord between any two adjacent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

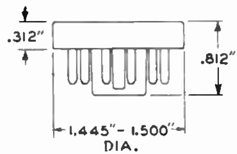
DWARF-SHELL DUODECAL

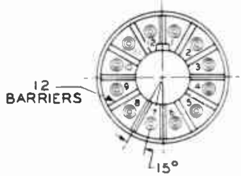




No. of Pins	Pins	JETEC No.	RCA No.
12-Pin	1,2,3,4,5,6,7,8,9,10,11,12	B12-157	12263
6-Pin	1,2,3, 10,11,12	B6-158	6263

ULTRASHORT SMALL-SHELL DUODECAL

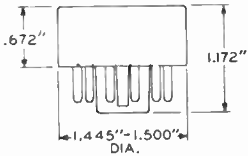


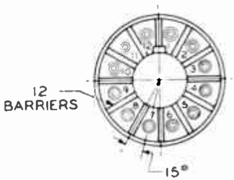


No. of Pins	Pins	JETEC No.	RCA No.
12-Pin	1,2,3,4,5,6,7,8,9,10,11,12.	B12-186	12261

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

SHORT SMALL-SHELL DUODECAL

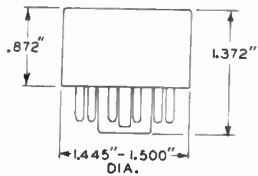


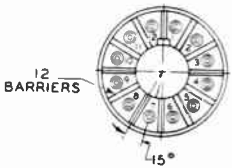


No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
12-Pin	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	B12-207	12267
6-Pin	1, 2, 6, 10, 11, 12	B6-203	6267

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

SMALL-SHELL DUODECAL



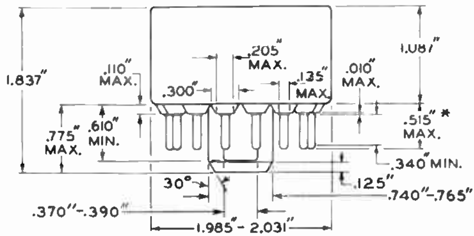


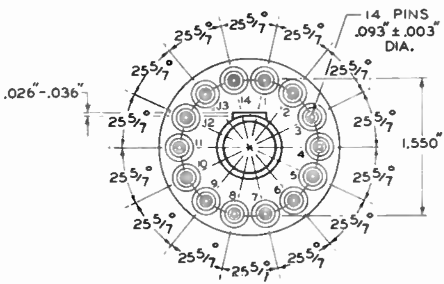
No. of Pins	Pins	JETEC No.	RCA No.
12-Pin	1,2,3,4,5,6,7,8,9,10,11,12	B12-43	12253
10-Pin	1,2,3,4, 6,7,8,9,10, 12	B10-75	10253
7-Pin■	1,2, 6,7, 10,11,12	B7-51	7253
7-Pin▲	1,2,3, 6, 10,11,12	B7-179	-
6-Pin■	1,2, 6, 10,11,12	B6-63	6253
6-Pin▲	4,5,6,7,8, 12	B6-180	-
5-Pin	1,2, 10,11,12	B5-57	5253

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

■ Arrangement 1.
▲ Arrangement 2.

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	1[illegible]560
12-Pin	1, 2, 3, 4, 5, 6, 7, 9, 11, 12, 13, 14	B12-131	12560

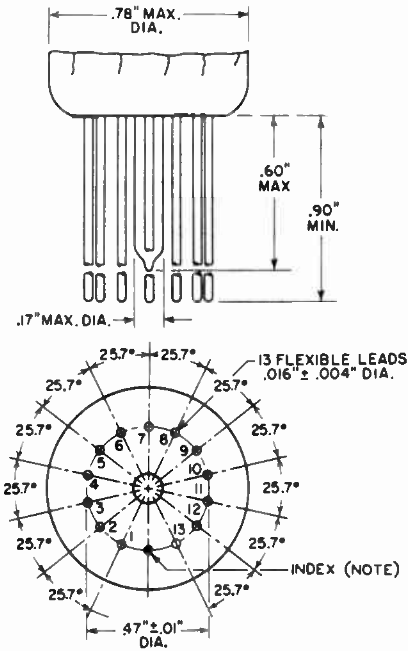
Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No. GB14-2) having thickness of 1/4" and fourteen holes with diameters of 0.1030" ± 0.0005" so located on a 1.5500" ± 0.0005" diameter circle that the distance along the chord between any two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

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

SMALL-BUTTON THIRTEENAR

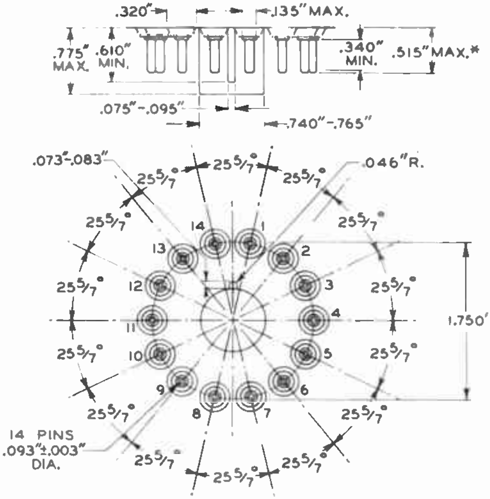


NOTE: LEAD IS CUT OFF WITHIN 0.04 INCH FROM THE GLASS BUTTON.

No. of Leads	*Leads*	*JEDEC No.*	*RCA No.*
13-Lead	1,2,3,4,5,6,7,8,9,10,11,12,13	E13-71	-
12-Lead▲	1,2,3,4,5,6,7,8,9,10,11,12,	E12-72	-

▲ Lead 13 is cut off within 0.04 inch from the glass button.

"DIHEPTAL"
PIN DIMENSIONS AND ORIENTATION AND INDEX GUIDE

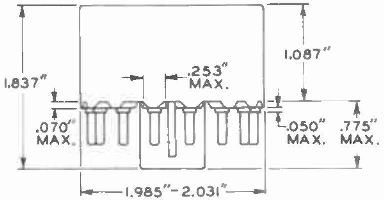


Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge (JETEC No.GB14-1) having thickness of 1/4" and fourteen holes with diameters of 0.1030" ± 0.0005" so located on a 1.750" ± 0.0005" diameter circle that the distance along the chord between any two hole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

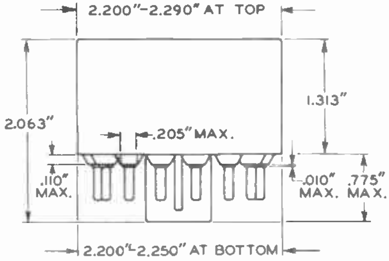
* Add 0.030" for solder on finished tube.

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



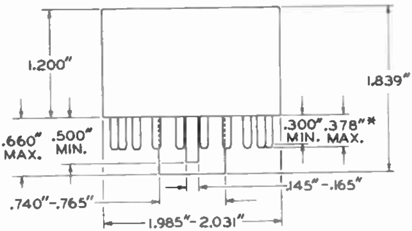
No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
14-Pin	1,2,3,4,5,6,7,8,9,10,11,12,13,14	B14-38	14146
12-Pin	1,2,3,4,5, 7,8,9,10,11,12, 14	B12-37	12146

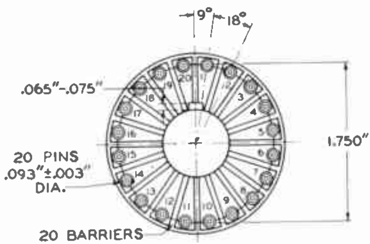
For other dimensions of above bases, see first page of the "Diheptal" series

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

20-PIN TYPES

SMALL-SHELL BIDECAL





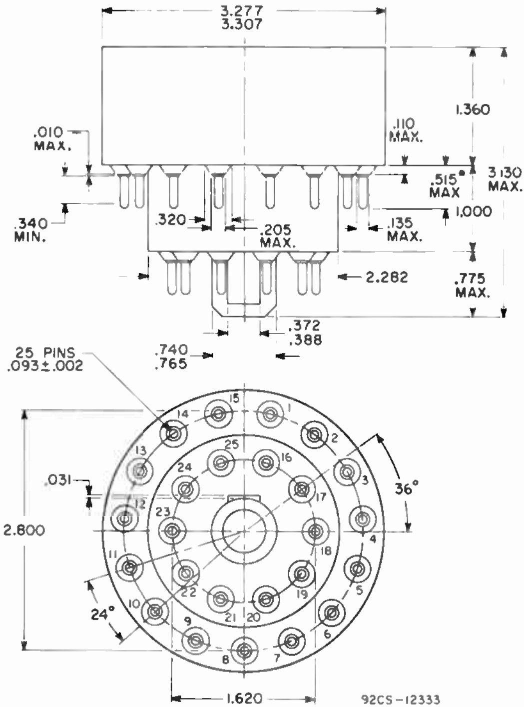
No. of Pins	*Pins*	*JETEC No.*	*RCA No.*
20-Pin	1 through 20	B20-102	20158

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.

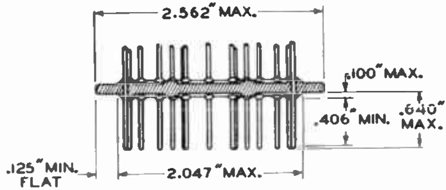
JEDEC No. B25-216

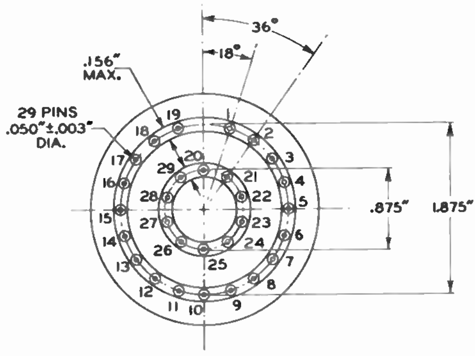


DIMENSIONS IN INCHES

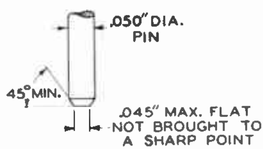
* Add 0.030 inch for solder.

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)

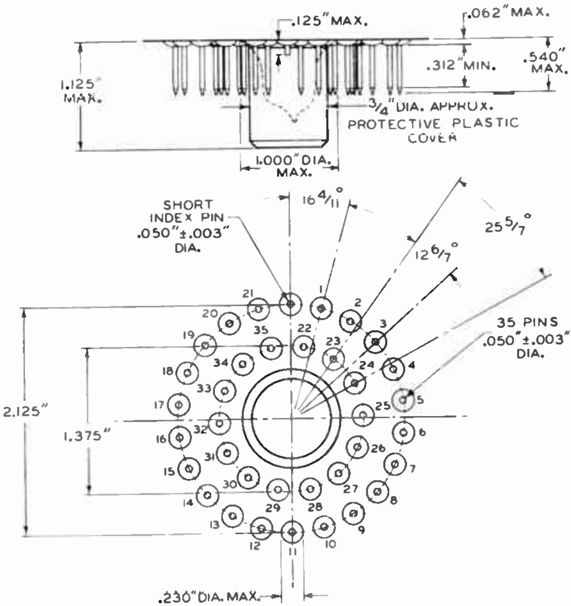
Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge having thickness of 3/8" and twenty-nine holes with diameters of 0.0700" ± 0.0005", nineteen of which are located with hole centers corresponding to the specified location of pin centers on a 1.8750"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

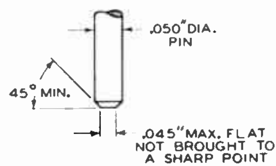
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

35-PIN TYPES

"THIRTYFIVAR"
PIN DIMENSIONS AND ORIENTATION



Thirtyfivar-Base Pin Contour



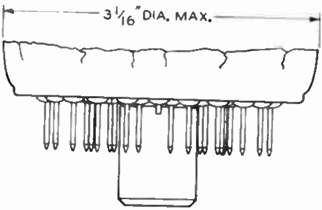
Base-pin positions are held to tolerances such that entire length of pins will enter flat-plate gauge having thickness of 3/8" and thirty-six holes with diameters of 0.0700" ± 0.0005", twenty-two of which are located with hole centers corresponding to the specified location of

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	-
21-Pin	1 through 21	E21-40	-

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

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY