



H-1587

CERMOLOX®
500 W PEP Output
38 dB Open Loop
Third Order Distortion
43 dB Third Order
Distortion w/Cathode R
Full Input to 400 MHz
Ruggedized, Reliable
Matrix Oxide Cathode

RCA-8791

Beam Power Tube

The RCA-8791* is designed specifically to meet the high linearity and low noise requirements of modern HF, single sideband equipments. In these equipments it can deliver 500 watts peak envelope power output at an open loop third order distortion level of better than 38 dB and a fifth order distortion level of better than 44 dB.

Its high gain, CERMOLOX tube construction and full input rating to 400 MHz also make it ideally suited for higher frequency applications such as VHF-TV modulated driver service and VHF or UHF Class B linear service where it will deliver one kilowatt peak sync. or 200 watts carrier output respectively.

The ruggedized, low inductance, coaxial construction of the 8791 enables the use of simple, economical circuit techniques in all HF, VHF, and UHF applications.

Its matrix oxide cathode enhances system reliability while the efficient, forced-air cooled radiator reduces system air requirements and permits more reliable, lower temperature operation.

To assure compliance with environmental design objectives, sample tubes are regularly subjected to 50g-11 milli-second shock; 500g-3/4 millisecond shock; and also 20g-2000 hertz vibration testing.

*Formerly RCA Dev. Type A2912

General Data

Electrical:

Heater-Cathode:

Type Unipotential, Oxide
 Coated, Matrix Type

Voltage^a (ac or dc) { 6.3 typ. V
 6.6 max. V

Current at 6.3 volts 7.5 A

Minimum heating time 120 s

Mu-Factor,

(Grid No.2 to Grid No.1) 13

Direct Interelectrode Capacitances^b:

Grid No.1 to plate 0.11 max. pF

Grid No.1 to cathode & heater 28 pF

Plate to cathode & heater 0.011 max. pF

Grid No.1 to grid No.2 38 pF

Grid No.2 to plate 5.5 pF

Grid No.2 to cathode & heater 1.1 max. pF

Mechanical:

Operating Position Any

Overall Length (61.0 mm) 2.40 max. in

Greatest Diameter (64.8 mm) 2.55 max. in

Terminal Connections See *Dimensional Outline*

Sockets See page 7

Radiator Integral part of tube

Weight (Approx.) (0.3 kg) 3/4 lb

Thermal:

Seal Temperature^c (Plate,

grid No.2, grid No.1,

cathode-heater and heater) 250 max. °C

Plate-Core Temperature 250 max. °C

Footnotes for General Data

^a See V.A.3 of 1CE-300.

^b Measured with special Adapter.

^c See *Dimensional Outline* for temperature measurement points.

This bulletin gives application information unique to the RCA 8791. General information, covering the installation and operation of this tube type, is given in the "Application Guide for RCA Power Tubes", 1CE-300. Close attention to the instructions contained therein will assure longer tube life, safer operation, less equipment downtime, and fewer tube handling accidents.

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**Linear RF Power Amplifier, Class AB₁^d
Single-Sideband Suppressed-Carrier Service**

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2

Maximum CCS Ratings, Absolute-Maximum Values:

	<i>Up to 400 MHz</i>
DC PLATE VOLTAGE	3,000 max. V
DC GRID-No.2 VOLTAGE	750 max. V
DC PLATE CURRENT AT PEAK OF ENVELOPE ^e	750 max. mA
GRID No.2 INPUT	25 max. W
PLATE DISSIPATION	1,000 max. W

Maximum Circuit Values:

GRID-No.1 CIRCUIT RESISTANCE With fixed bias	15,000 max. Ω
With cathode bias	Not recommended
PLATE CIRCUIT IMPEDANCE	See Note f
GRID-No.2 CIRCUIT IMPEDANCE	See Note g

Typical Class AB₁ CCS Operation with "Two-Tone Modulation":

	<i>at 30 Mc</i>		
DC Plate Voltage	2000	2000	2500 V
DC Grid-No.2 Voltage	450	450	350 V
DC Grid-No.1 Voltage	-34	-32	-26 V
Zero-Signal DC Plate Current	250	250	200 mA
Effective RF Load Resistance	1850	1850	2750 Ω
DC Plate Current at Peak of Envelope	535	545	430 mA
Average DC Plate Current . . .	400	410	320 mA
DC Grid-No.2 Current at Peak of Envelope	-1.2	+0.2	-4.0 mA
Average DC Grid-No.2 Current	-4.0	-4.0	-3.0 mA
Peak RF Grid-No.1 Voltage . . .	30	40	22 V
Output-Circuit Efficiency (Approx.)	90	90	90 %
Distortion Products Level:			
Third Order	37	42	37 dB
Fifth Order	49	54	53 dB
Unbypassed Cathode Resistor	0	10	0 Ω
Useful Power Output (Approx.)			
Average	250	250	250 W
Peak envelope	500	500	500 W

**Linear RF Power Amplifier^d
Class AB or Class B Telephony**

Carrier conditions for use with a maximum modulation factor of 1.0

Maximum CCS Ratings, Absolute-Maximum Values:

DC PLATE VOLTAGE	3000 max. V
DC GRID-No.2 VOLTAGE	750 max. V
DC PLATE CURRENT	500 max. mA
GRID-No.2 INPUT	25 max. W
PLATE DISSIPATION	1000 max. W

Calculated CCS Operation as a Class AB₁ Amplifier
In a cathode drive circuit, at 400 MHz with an output circuit bandwidth of 10.0 MHz.^h

DC Plate Voltage	2500 V
DC Grid-No.2 Voltage	450 V
DC Grid-No.1 Voltage	-45 V
DC Plate Current	340 mA
DC Grid-No.1 Current	0 A
DC Grid-No.2 Current	-2.0 mA
Drive Power	8.0 W
Output Circuit Efficiency (Approx.)	80 %
Useful Power Output	200 W

Footnotes for Ratings

^d See Section V.C. of 1CE-300.

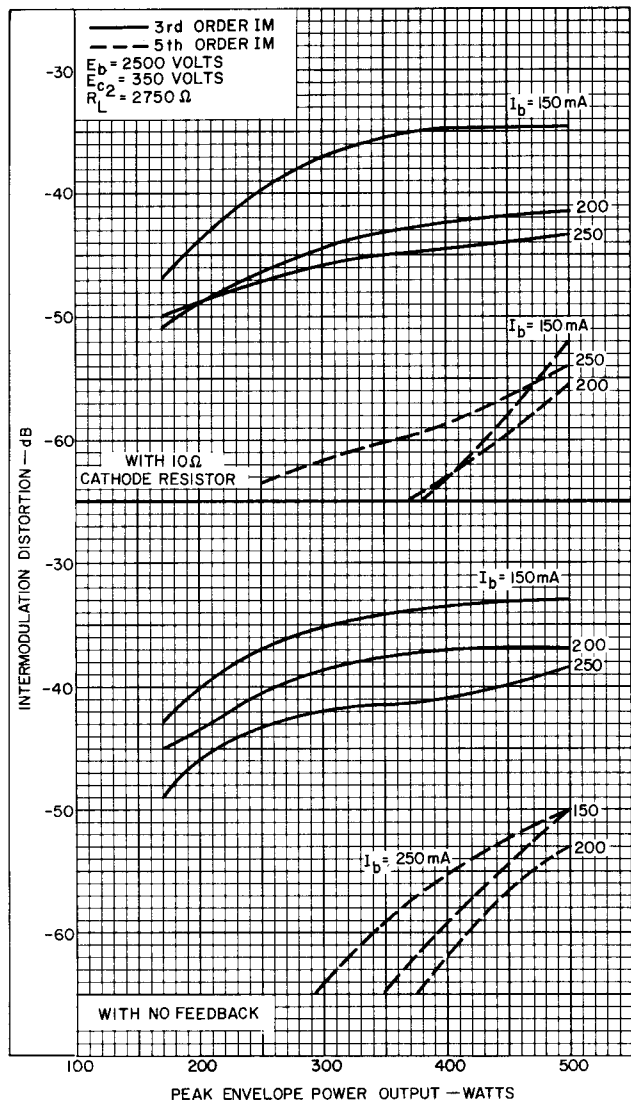
^f See Sections V.B. and V.B.1 of 1CE-300.

^e During short periods of circuit adjustment, under "Single Tone" conditions, the average plate current may be as high as 750 mA.

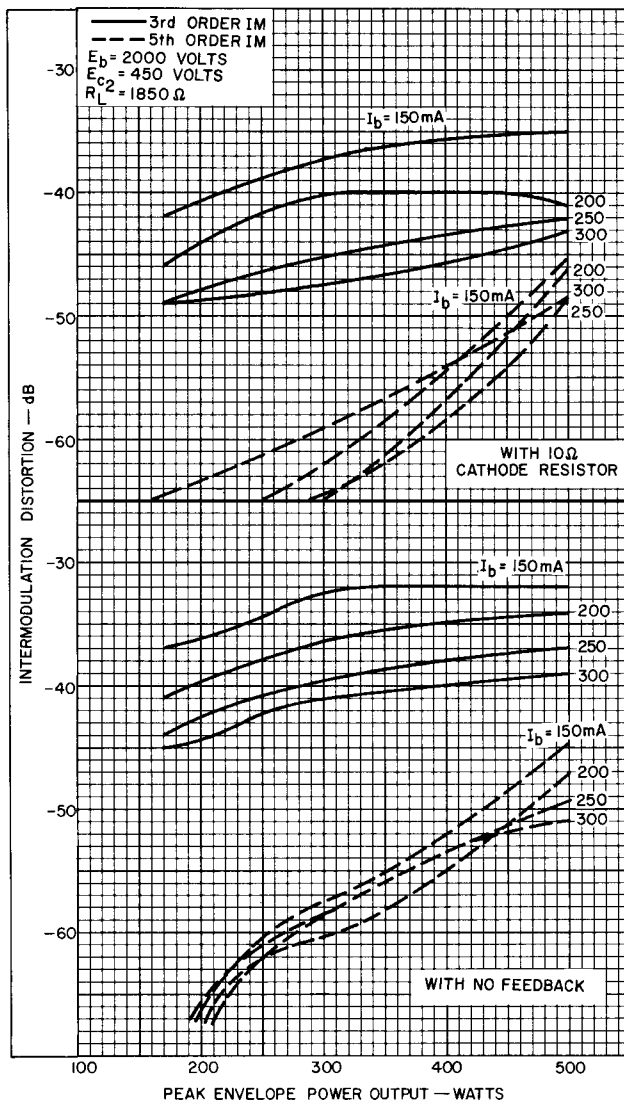
^g See Section V.B.2 of 1CE-300.

^h Computed between half power points and based on 1-1/2 times tube output capacity.

Intermodulation Distortion Versus Power Output



92LM-2389



92LM-2390

Grid-Modulated RF Power Amplifier – Class C Television Service^d

Synchronizing-level conditions per tube unless otherwise specified

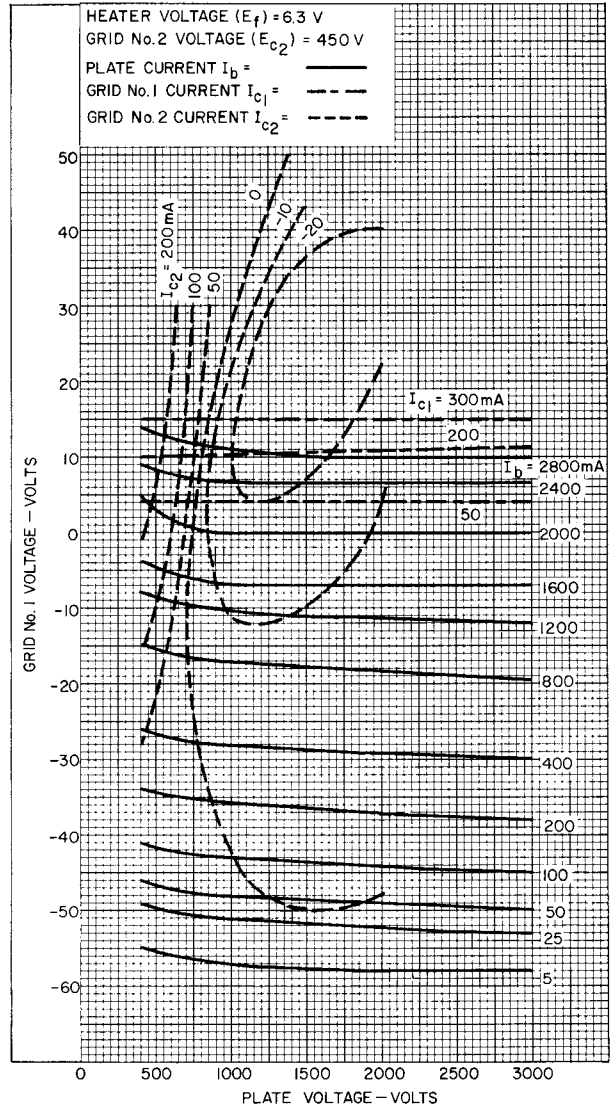
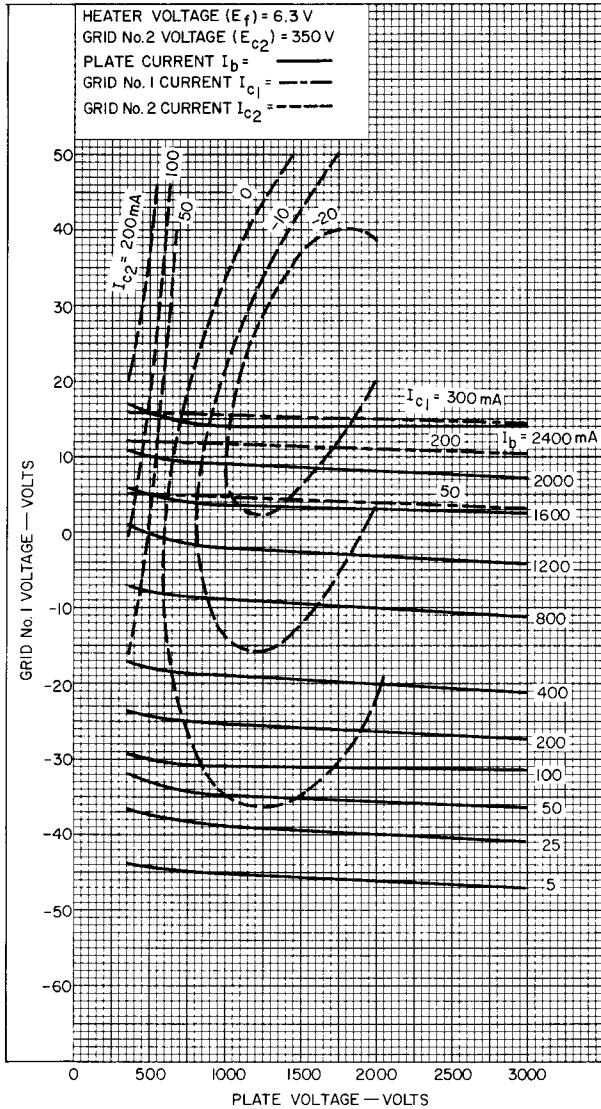
Maximum CCS Ratings, Absolute-Maximum Values:

	Up to 216 MHz
DC PLATE VOLTAGE	3000 max. V
DC GRID-No.2 VOLTAGE	750 max. V
DC GRID-No.1 VOLTAGE	
(White level)	-250 max. V
DC PLATE CURRENT	750 max. mA
GRID-No.2 INPUT	25 max. W
PLATE DISSIPATION	1000 max. W
GRID-No.1 CURRENT	100 max. mA

Calculated Operation in Grid-Drive Circuit at 216 MHz Bandwidth of 8.5 MHz^h

DC Plate Voltage	2700 V
DC Grid-No.2 Voltage	450 V
DC Grid-No.1 Voltage:	
Synchronizing level	-70 V
Pedestal level	-80 V
White level	-110 V
Peak RF Grid-No.1 Voltage	70 V
DC Plate Current:	
Synchronizing level	700 mA
Pedestal level	500 mA
DC Grid-No.1 Current (Approx.):	
Synchronizing level	0 A
Pedestal level	0 A
Driver Power Output (Approx.):	
Synchronizing level	8 W
Pedestal level	4.5 W
Useful Power Output (Approx.):	
Synchronizing level	1100 W
Pedestal level	615 W

Typical Constant Current Characteristics



92LM-2386

92LM-2385

Characteristics Range Values

	Note	Min.	Max.	Unit
1. Heater Current	i	6.9	8.3	A
2. Direct Interelectrode Capacitances:				
Grid No.1 to plate	k	-	0.11	pF
Grid No.1 to cathode & heater	k	26	32	pF
Plate to cathode & heater	k	0.011		pF

	Note	Min.	Max.	Unit
Grid No.1 to grid No.2	k	34	41	pF
Grid No.2 to plate & heater	k	4.3	6.3	pF
3. Reverse Grid-No.1 current	j,m	-	-50	μA
4. Peak Emission	n,p	80	-	A
5. Interelectrode Leakage Resistance	r	8.0	-	MΩ
6. Cutoff Grid-No.1 Voltage	i,s	-	-87	V

Footnotes for Range Values

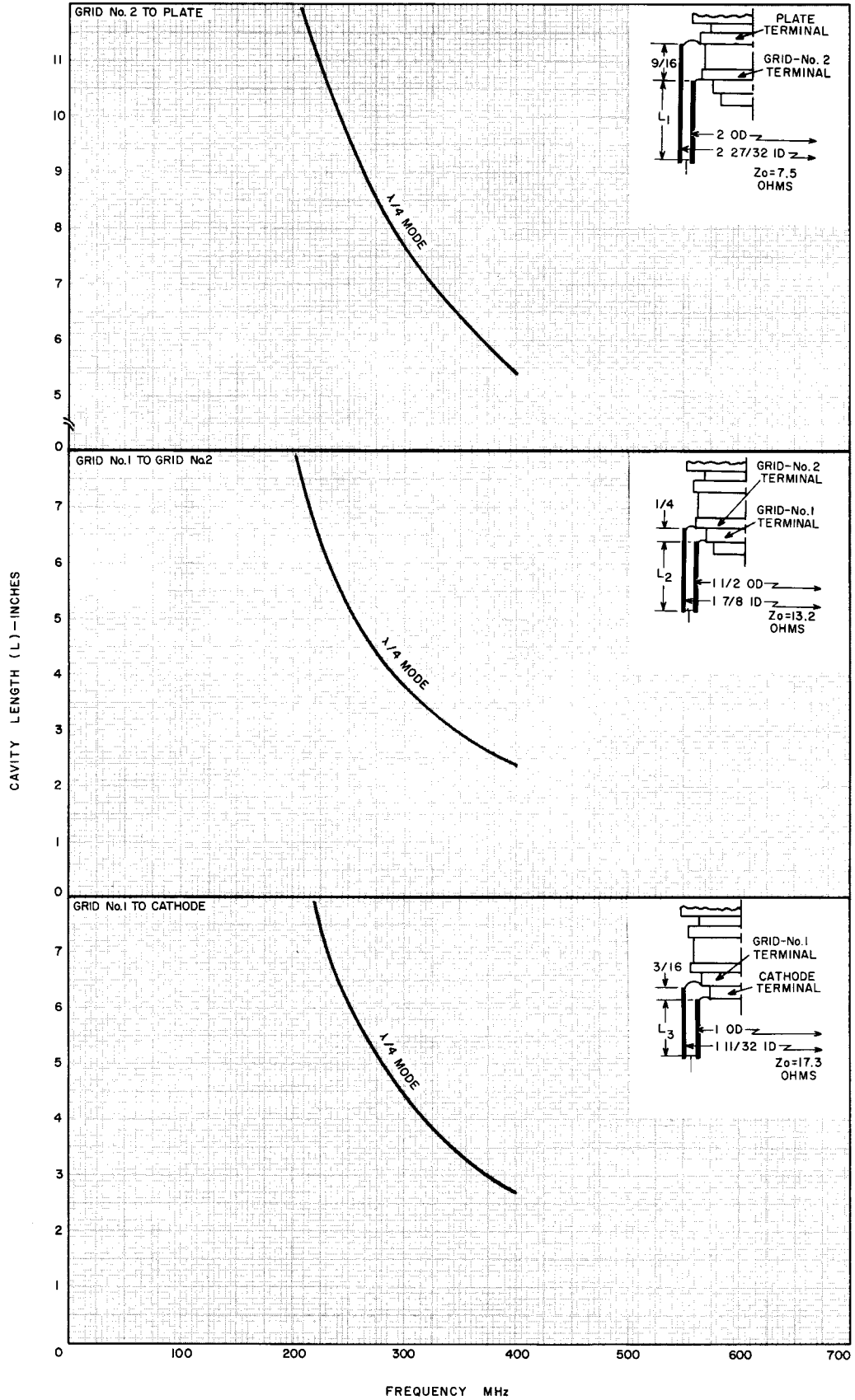
- i With 6.3 V ac or dc on heater.
- k Measured with special shield adapter.
- m With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and dc grid-No.1 voltage adjusted to give a plate current of 240 mA.
- n See V.A.3 of 1CE-300.
- p For conditions with grid-No.1, grid-No.2, and plate tied together; and pulse voltage source of 850 peak volts, between plate and cathode. Pulse duration is 2 micro-seconds, pulse repetition frequency is 60 pps, and duty

factor is 0.00012. Peak emission current is read after 1 minute.

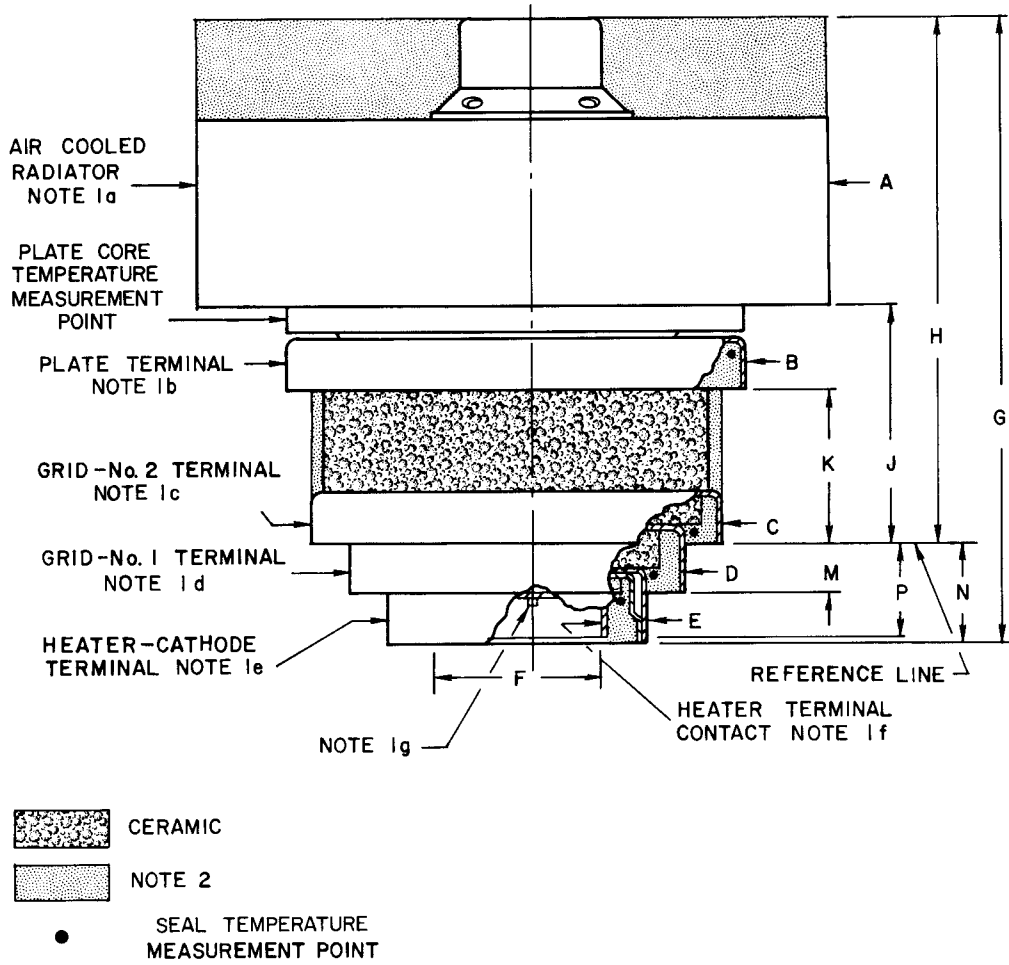
r Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two electrodes (except across heater terminals) is measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1.0 megohm.

s With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and dc grid-No.1 voltage adjusted to give a plate current of 5 mA.

Electrode Cavity Tuning Characteristics



Dimensional Outline



92LS-2540

Tabulated Dimensions *

Dimension	Value			
A	2.52	(64.0)	Max.	Dia.
B	1.745	(44.32)	Min.	Dia.
C	1.590	(40.38)	Min.	Dia.
D	1.290	(32.76)	Min.	Dia.
E	0.99	(25.14)	Min.	Dia.
F	0.67	(17.02)	Max.	Dia.
G	2.40	(60.96)	Max.	
H	1.94 ± .04	(49.28 ± 1.01)		
J	0.895 ± .035	(22.73 ± .88)		
K	0.575 ± .025	(14.61 ± .63)		
M	0.20 ± .02	(6.08 ± .50)		
N	0.40 ± .020	(10.16 ± .50)		
P	0.385 ± .025	(9.78 ± .63)		

*Dimensions are in inches unless otherwise stated. Dimensions in parentheses are in millimeters and are derived from the basic inch dimension (1 inch = 25.4 mm).

Note 1: The contact distance* listed is the indicated, uniform length as measured from the edge of the terminal. Concentricity between the various diameters is maintained within such tolerances that the tube will enter a gauge having suitably spaced apertures or post of the indicated diameters*.

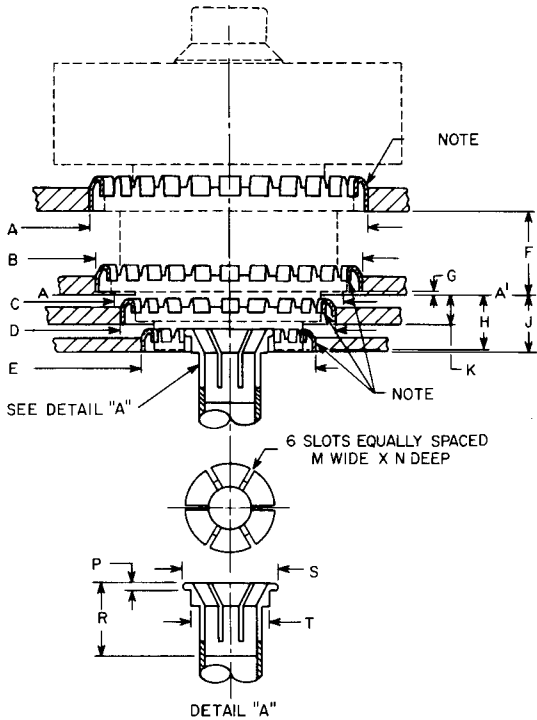
Note Element	Contact Distance	Gauge Diameter
1a. Radiator	0.755 (19.1) min.	2.550 (64.70)
1b. Plate Terminal	0.145 (3.68) min.	1.801 (45.75)
1c. Grid-No.2 Terminal	0.150 (3.81) min.	1.611 (40.92)
1d. Grid-No.1 Terminal	0.180 (4.57) min.	1.321 (33.56)
1e. Heater-Cathode Terminal	0.160 (4.06) min.	1.021 (25.94)
1f. Heater Terminal(post)	0.115 (2.92) max.	0.619 (15.72)
1g. Pin		0.062 (1.58)

Note 2: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes. Diameters of stippled areas above air-cooled radiator, plate terminal contact surface, and grid-No.2 terminal contact surface shall not be greater than its associated diameter.

Mounting

See the preferred mounting arrangement below. See section III.C.3a of 1CE-300 for a description of the fixed method of mounting. The adjustable method is not recommended for the 8791. Special sockets are available.

Preferred Mounting Arrangement and Layout of Associated Contacts



92LS-254I

Tabulated Dimensions*

Dimension	Value		
A	1.938 ± .001	(49.225 ± .025)	Dia.
B	1.746 ± .001	(44.348 ± .025)	Dia.
C	1.550 ± .001	(39.370 ± .025)	Dia.
D	1.448 ± .001	(36.779 ± .025)	Dia.
E	1.148 ± .001	(29.159 ± .025)	Dia.
F	0.591 ± .005	(15.01 ± .12)	
G	0.040 ± .005	(1.02 ± .12)	
H	0.385 ± .005	(9.78 ± .12)	
J	0.400 ± .005	(10.16 ± .12)	
K	0.184 ± .005	(4.67 ± .12)	
M	0.020 ± .010	(0.51 ± .25)	
N	0.400 ± .005	(10.16 ± .12)	
P	0.050 ± .005	(1.27 ± .12)	
R	0.500 ± .005	(12.70 ± .12)	
S	0.670 ± .001	(17.018 ± .025)	Dia.
T	0.565 ± .005	(14.35 ± .12)	Dia.

*Dimensions are in inches unless otherwise stated. Dimensions in parentheses are in millimeters and are derived from the basic inch dimension (1 inch = 25.4 mm).

Note: Contact Strip: No.97-360A as made by: Instrument Specialties Co., Little Falls, N.J.

- Socket Erie 9806-002
(with G₂ bypass) or equivalent
- Socket Jettron 89-081
(w/o bypass) or equivalent
- Grid-No.2 Bypass Erie 9811-000
or equivalent

Sockets may be obtained from:
 Erie Technological Products Inc.
 644 West 12th Street, Erie, Pa. 16512
 Jettron Products Incorporated
 56 Route 10, Hanover, N.J. 07936

Forced-Air Cooling

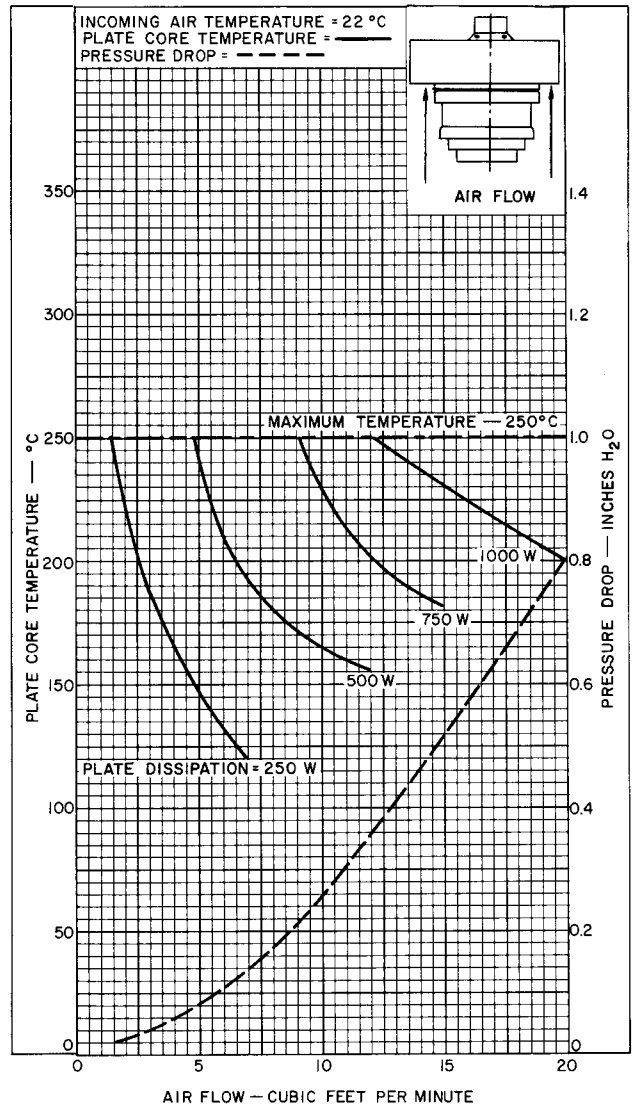
Air Flow:

Through radiator – Adequate air flow to limit the plate-core temperature to 250°C should be delivered by a blower through the radiator before and during the application of filament, plate, grid-No.2, and grid-No.1 voltages. In typical operation at 750 watts plate dissipation and 200°C plate core temperature 12 cfm at 0.36 inch of water at 22°C ambient air temperature should be sufficient as shown on Air Flow Chart.

To Plate, Grid-No.2, Grid-No.1, Cathode-Filament, and Filament Terminals – A sufficient quantity of air should be allowed to flow past each of these terminals so that their temperature does not exceed the specified maximum value of 250°F.

During Standby Operation – Cooling air is required when only filament voltage is applied to the tube.

During Shutdown Operation – Air flow should continue for a few minutes after all electrode power is removed



92LM-2384