8646

Beam Power Tube

COAXIAL-ELECTRODE STRUCTURE
CERAMIC-METAL CONSTRUCTION

UNIPOTENTIAL CATHODE
FORCED-AIR COOLED

For Use as an RF Power Amplifier, Oscillator, Regulator, Distributed Amplifier, or Linear RF Power Amplifier in Mobile or Stationary Equipment

ELECTRICAL

Heater, for Unipotential Cathode[f]		
Voltage (AC or DC)[a]	26.5 ± 10%	V
Current at 26.5 V	0.64	A
Minimum heating time	60	s
Mu-Factor, Grid No.2 to Grid No.1	12	
Direct Interelectrode Capacitances[b]		
Grid No.1 to plate	0.13 max	pF
Grid No.1 to cathode	16	pF
Plate to cathode	0.011	pF
Grid No.1 to grid No.2	22	pF
Grid No.2 to plate	6.5	pF
Grid No.2 to cathode	3.2	pF
Cathode to heater	5.2	pF

MECHANICAL

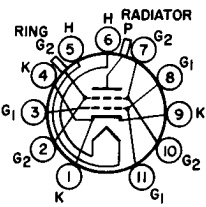
Operating Position . . . . . Any
Maximum Overall Length . . . . . 2.196 in
Seated Length . . . . . 1.850 ± 0.065 in
Diameter . . . . . 1.460 ± 0.015 in
Weight (Approx.) . . . . . 3 oz
Socket . . . . . **Johnson**[c] **No.124-311-100, Mycalex**[d] **No.CP464-2, or equivalent**
Grid-No.2 Bypass Capacitor . . . . . **Johnson**[c] **No.124-121, or equivalent**
Base — Large Wafer Elevenar 11-Pin with Ring (JEDEC No.E11-81)

THERMAL

Terminal Temperature (All Terminals)	250 max	°C
Radiator Core Temperature See *Dimensional Outline*	250 max	°C
Air Flow[g] See *Typical Cooling Characteristics*		

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Cathode
Pin 2 – Grid No.2
Pin 3 – Grid No.1
Pin 4 – Cathode
Pin 5 – Heater
Pin 6 – Heater
Pin 7 – Grid No.2
Pin 8 – Grid No.1
Pin 9 – Cathode
Pin 10 – Grid No.2



Pin 11 – Grid No.1
Radiator – Plate Terminal
Ring – Grid-No.2 Terminal
Contact Surface (For use at higher frequencies)

LINEAR RF POWER AMPLIFIER[h]

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

	Up to 500 Mc/s	
DC Plate Voltage	2200	V
DC Grid-No.2 Voltage	400	V
DC Grid-No.1 Voltage	-100	V
DC Plate Current at Peak of Envelope	450[e]	mA
DC Grid-No.1 Current	100	mA
Plate Dissipation	150	W
Grid-No.2 Dissipation	8	W
Peak Heater-Cathode Voltage		
Heater negative with respect to cathode	150	V
Heater positive with respect to cathode	150	V

Maximum Circuit Values

Grid-No.1-Circuit Resistance Under Any Condition		
With fixed bias	25,000	Ω
With fixed bias (In Class AB_1 operation)	100,000	Ω
With cathode bias	Not recommended	
Grid-No.2 Circuit Impedance	*See Note* j	
Plate Circuit Impedance	*See Note* k	

Typical CCS Operation with "Two-Tone Modulation"

	At 30 Mc/s		
DC Plate Voltage	1000	1500	V
DC Grid-No.2 Voltage	250	250	V
DC Grid-No.1 Voltage	-20	-20	V
Zero-Signal DC Plate Current	100	100	mA
Effective RF Load Resistance	2270	3800	Ω
DC Plate Current at Peak of Envelope	210	210	mA
Average DC Plate Current	160	160	mA
DC Grid-No.2 Current at Peak of Envelope	10	10	mA
Average DC Grid-No.2 Current	7	7	mA
Average DC Grid-No.1 Current	0.05	0.05	mA
Peak-Envelope Driver Power Output (Approx.)	0.3	0.3	W
Output-Circuit Efficiency (Approx.)	90	85	%
Distortion Products Level			
Third Order	35	35	dB
Fifth Order	40	40	dB
Useful Power Output (Approx.)			
Average	55	85	W
Peak envelope	110	170	W

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 500 Mc/s	
DC Plate Voltage	1800	V
DC Grid-No.2 Voltage	400	V

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

	Up to 500 Mc/s	
DC Grid-No.1 Voltage	-100	V
DC Plate Current	250	mA
DC Grid-No.1 Current	100	mA
Grid-No.2 Input	5	W
Plate Dissipation	105	W

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[h]
and
RF POWER AMPLIFIER — Class C FM Telephony[h]

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 500 Mc/s	
DC Plate Voltage	2200	V
DC Grid-No.2 Voltage	400	V
DC Grid-No.1 Voltage	-100	V
DC Plate Current	300	mA
DC Grid-No.1 Current	100	mA
Grid-No.2 Dissipation	8	W
Plate Dissipation	150	W
Peak Heater-Cathode Voltage		
Heater negative with respect to cathode	150	V
Heater positive with respect to cathode	150	V

Maximum Circuit Values

Grid-No.1-Circuit Resistance Under Any Condition		
With fixed bias	25,000	Ω
Grid-No.2 Circuit Impedance	*See Note*[j]	
Plate Circuit Impedance	*See Note*[k]	

Typical CCS Operation

In Grid-Drive Circuit at 50 Mc/s

DC Plate Voltage	700	1000	1500	V
DC Grid-No.2 Voltage	175	200	200	V
DC Grid-No.1 Voltage	-10	-30	-30	V
DC Plate Current	300	300	300	mA
DC Grid-No.2 Current	25	20	20	mA
DC Grid-No.1 Current	50	40	40	mA
Driver Power Output (Approx.)	1.2	2.0	2.0	W
Useful Power Output	120	175	275	W

In Grid-Drive Circuits at 470 Mc/s

DC Plate Voltage	700	1000	1500	V
DC Grid-No.2 Voltage	200	200	200	V
DC Grid-No.1 Voltage	-30	-30	-30	V
DC Plate Current	300	300	300	mA
DC Grid-No.2 Current	10	10	5	mA
DC Grid-No.1 Current	30	30	30	mA
Driver Power Output (Approx.)	8	8	8	W
Useful Power Output	100	165	235	W

[h] Because the cathode is subjected to back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should, for optimum life, be reduced to a value such that at the heater voltage obtained at minimum supply voltage conditions (all other voltages constant) the tube performance just starts to show some degradation; e.g., at 470 Mc/s, heater volts = 24.5 (Approx.).

[b] Measured with special shield adapter.

[c] E. F. Johnson Co., 299 10th Ave. S. W., Waseca, Minn.

[d] Mycalex Corp. of America, 125 Clifton Blvd., Clifton, N.J.

[e] The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as is obtained in "Single-Tone" operation, is 300 mA. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 mA.

The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at front of this section.

[f] See *Electrical Considerations* — Filament or Heater.

[g] See *Cooling Considerations* — Forced-Air Cooling.

[h] See *Classes of Service*

[j] See *Electrical Considerations* — Grid-No.2 Voltage Supply

[k] See *Electrical Considerations* — Plate Voltage Supply

CHARACTERISTICS RANGE VALUES

	Note	*Min*	*Max*	
1. Heater Current	1	0.60	0.68	A
2. Direct Interelectrode Capacitances				
Grid No.1 to plate	2	-	0.13	pF
Grid No.1 to cathode	2	14.3	17.7	pF
Plate to cathode	2	0.0065	0.0155	pF
Grid No.1 to grid-No.2	2	19.8	24.2	pF
Grid No.2 to plate	2	5.7	7.1	pF
Grid No.2 to cathode	2	2.6	3.6	pF
Cathode to heater	2	4.9	5.5	pF
3. Grid-No.1 Voltage	1,3	-8	-19	V
4. Reverse Grid-No.1 Current	1,3	-	-25	μA
5. Grid-No.2 Current	1,3	-7	+6	mA
6. Peak Emission	1,4	13	-	peak A
7. Interelectrode Leakage Resistance	5	1.0	-	MΩ
8. Cutoff Grid-No.1 Voltage	1,6	-	-44	V

Note 1: With 26.5 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage at 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 185 mA.

Note 4: For conditions with grid No.1, grid No.2, and plate tied together; and pulse voltage source connected between plate and cathode. Pulse duration is 2.5 microseconds and pulse repetition frequency is 60 pps. The voltage-pulse amplitude is 200 volts peak. After 1 minute at this value, the current-pulse amplitude will not be less than the value specified.

Note 5: Under conditions with tube at 20° to 30°C for at least 30 minutes without any voltages applied to the tube. The resistance between any two electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1.0 megohm, will be less than the value specified.

Note 6: With dc plate voltage of 2000 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage varied to obtain a plate current of 5 mA.

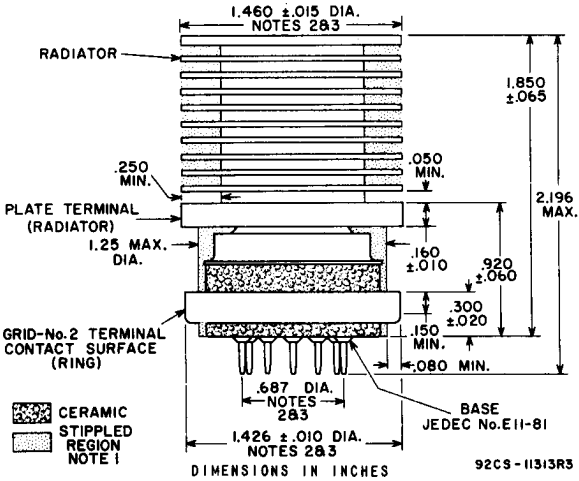
OPERATING CONSIDERATIONS

For considerations common to all RCA Power tubes, See *RCA Transmitting Tube Operating Considerations* given at front of this section. Additional considerations specifically for the 8646 are given below.

Mounting. The plate connection to the 8646 may be made by a metal band or spring contacts to the larger fin of the radiator which is located at the base end.

If rigid connections are made to more than one plane (base, flange, and radiator), adjustment must be made in a plane normal to the major tube axis to compensate for variations in concentricity for the associated parts of the tube. See *Dimensional Outline*.

DIMENSIONAL OUTLINE



Note 1: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

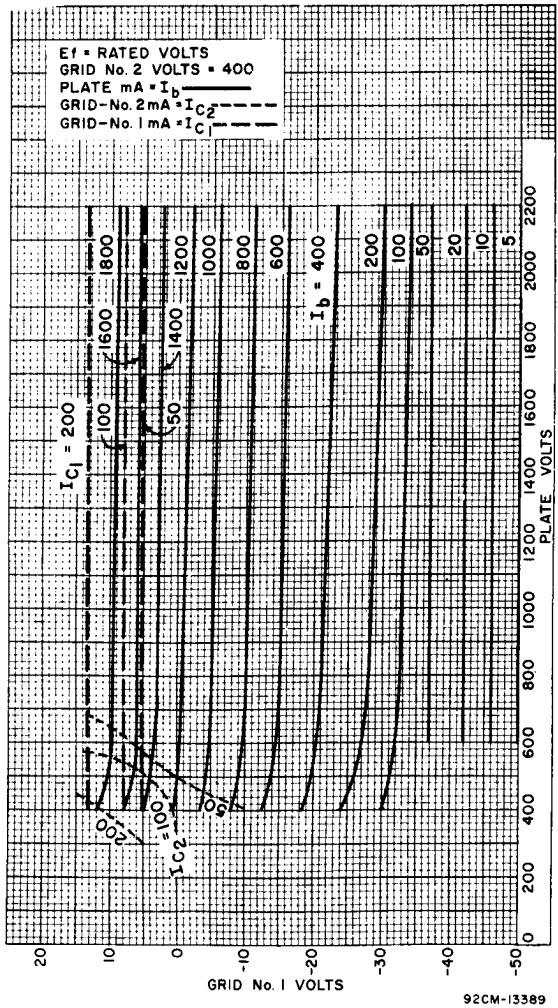
Note 2: The diameters of the radiator, grid-No.2 terminal contact surface, and pin circle to be concentric within the following values of maximum full indicator reading:

Radiator to Grid-No.2 Terminal Contact Surface. .	0.030 in max
Radiator to Pin Circle.	0.040 in max
Grid-No.2 Terminal Contact Surface to Pin Circle . .	0.030 in max

Note 3: The full indicator reading is the maximum deviation in radial position of a surface when the tube is completely rotated about the center of the reference surface. It is a measure of the total effect of runout and ellipticity.

Typical Constant-Current Characteristics

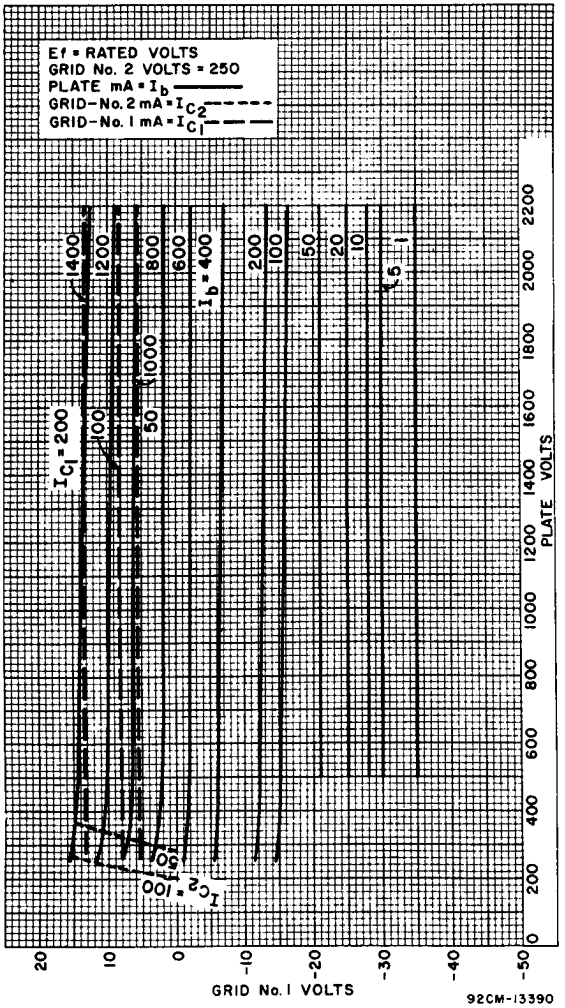
For Grid-No.2 Voltage = 400 Volts



RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

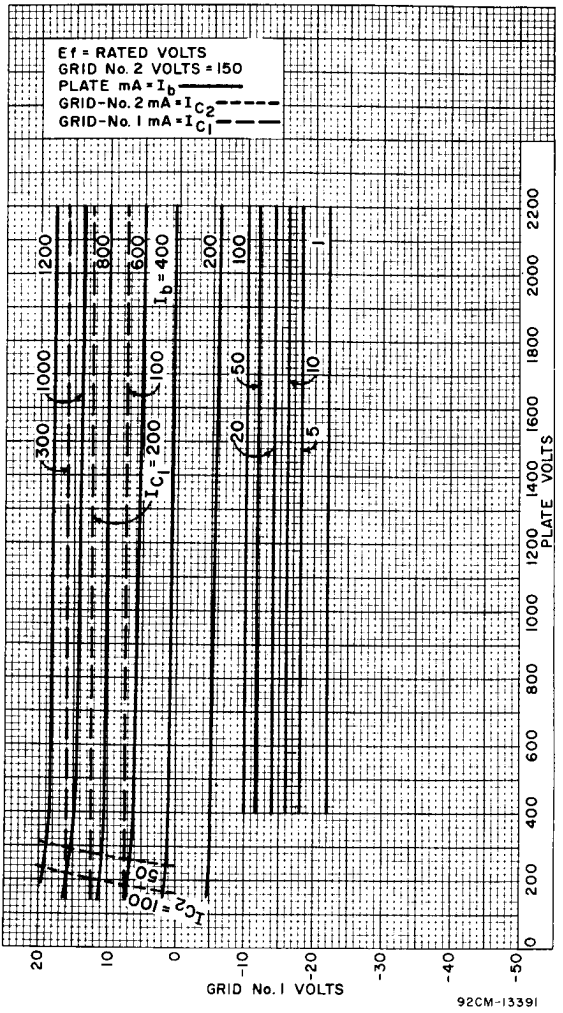
Typical Constant-Current Characteristics

For Grid-No. 2 Voltage = 250 Volts



Typical Constant-Current Characteristics

For Grid-No. 2 Voltage = 150 Volts



RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Typical Cooling Characteristics