H-1300

Beam Power Tube

RCA-6146A

90 Watts CW Input (ICAS) up to 60 Mc
60 Watts CW Input (ICAS) at 175 Mc
Sturdy Structure

RCA "Dark Heater"
Octal 8-Pin Base Small Size
Controlled Zero-Bias Plate Current

The RCA-6146A is a small, sturdy, beam power tube having high efficiency and high power sensitivity. It is designed for use as an rf power amplifier and oscillator as well as an af power amplifier and modulator in both mobile and fixed equipment. It can be operated with full input to 60 MHz and with reduced input to 175 MHz.

The 6146A features dependable performance with battery power supplies because it is designed to deliver not less than 90% of rated power output when the heater voltage is reduced to five volts.

Controlled zero-bias plate current is offered in the 6146A to assure dependable performance as a Class AB_1 linear rf amplifier for single sideband, suppressed-carrier service.

Also featured in the design of the 6146A is the RCA "Dark Heater", which functions efficiently at operating temperatures 350° K below those of heaters in conventional tube types. The dark surface of the new heater radiates heat more efficiently to the cathode so that optimum cathode temperature may be maintained with the heater operating at approximately 1350° K.

Small in size for its power output capability, the 6146A employs a rugged construction with short internal leads, triple connection to the cathode and to grid No.3 (both are joined to the internal shield inside the tube) to obtain effective rf grounding, and an octal base with a short metal sleeve having its own base pin terminal.

The 6146A is unilaterally interchangeable with the 6146.

General Data

Electrical:

Heater, for Unipotential Cathode:		
Voltage (ac or dc)[a]	6.3	V
Current at 6.3 volts	1.25	A
Minimum heating time[b]	60	s
Transconductance[c]	7000	μmhos
Mu-Factor[c] Grid No.2 to Grid No.1	4.5	
Direct Interelectrode Capacitances:		
Grid No.1 to Plate	0.24 max.	pF
Grid No.1 to Cathode[d]	13	pF
Plate to Cathode[d]	8.5	pF

Mechanical:

Operating Position	Any
Overall Length	(96.8 mm) 3.812 max. in
Seated Length	(82.6 mm) 3.250 max. in
Diameter	(42.07 mm) 1.656 max. in
Bulb	T12
Cap	Small (JEDEC No.C1-1)
Base[e]	Small 8-Pin Octal Wafer with Sleeve (JEDEC Group 1, No.B8-150)
Bulb Temperature[f] (at hottest point)	220 max. °C
Weight (Approx.)	(28 gr) 2.3 oz

Notes for General Data

[a] See Section V.A. of 1CE-300.

[b] See Section V.A.4 of 1CE-300.

[c] For Plate Voltage = 200 V, Grid No.2 Voltage = 200 V, and Plate Current = 100 mA.

[d] Cathode connected to Grid No.3, Internal Shield Base Sleeve, Grid No.2 and Heater.

[e] Alternate JEDEC Group 1 bases: No.B8-86, No.B8-98, and No.B8-159.

[f] See Section IV.A of 1CE-300.

This bulletin gives application information unique to the RCA 6146A. 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.

RCA Electronic Components

Printed in U.S.A. | 7-69
Supersedes 5-63 6146A

AF Power Amplifier & Modulator – Class AB_1[g]

Maximum Ratings, *Absolute-Maximum Values:*

	CCS	ICAS	
DC Plate Voltage[h]	600	750 max.	V
DC Grid-No.2 Voltage[i]	250	250 max.	V
Max.-Signal DC Plate Current[k]	125	135 max.	mA
Max.-Signal Plate Input[k]	60	85 max.	W
Max.-Signal Grid-No.2 Input[k]	3	3 max.	W
Plate Dissipation[k]	20	25 max.	W
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	135	135 max.	V
Heater positive with respect to cathode	135	135 max.	V

Typical Operation:

Values are for 2 tubes[k]

	CCS		ICAS		
DC Plate Voltage	500	600	600	750	V
DC Grid-No.2 Voltage	185	180	200	195	V
DC Grid-No.1 Voltage:					
With fixed-bias source	-40	-45	-50	-50	V
Peak AF Grid-No.1-to-Grid-No.1 Voltage[k]	80	90	100	100	V
Zero-Signal DC Plate Current	57	26	28	23	mA
Max.-Signal DC Plate Current	215	200	229	220	mA
Zero-Signal DC Grid-No.2 Current	2	1	1	1	mA
Max.-Signal DC Grid-No.2 Current	25	23	27	26	mA
Effective Load Resistance (Plate to plate)	5500	7000	6000	8000	Ω
Max.-Signal Driving Power (Approx.)	0	0	0	0	W
Max.-Signal Power Output (Approx.)	70	82	95	120	W

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance under Any Condition:[k]

With fixed bias	0.1 max.	MΩ
With cathode bias	Not recommended	

Linear RF Power Amplifier – Class AB_1[g]

Single-Sideband Suppressed-Carrier Service

Maximum Ratings, *Absolute-Maximum Values up to 60 MHz*

	CCS	ICAS	
DC Plate Voltage[h]	600	750 max.	V
DC Grid-No.2 Voltage[i]	250	250 max.	V
Max.-Signal DC Plate Current	125	135 max.	mA
Max.-Signal Plate Input	60	85 max.	W
Max.-Signal Grid-No.2 Input	3	3 max.	W
Plate Dissipation	20	25 max.	W
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	135	135 max.	V
Heater positive with respect to cathode	135	135 max.	V

Typical Operation:

At 60 MHz with "Single-Tone" Modulation

	CCS		ICAS		
DC Plate Voltage	400	600	600	750	V
DC Grid-No.2 Voltage[m]	190	180	200	195	V
DC Grid-No.1 Voltage[n]	-40	-45	-50	-50	V
Zero-Signal DC Plate Current	32	13	14	12	mA
Effective RF Load Resistance	2000	3500	3000	4000	Ω
Max.-Signal DC Plate Current	114	100	115	110	mA
Max.-Signal DC Grid-No.2 Current	12	11	14	13	mA
Max.-Signal Peak RF Grid-No.1 Voltage	40	45	50	50	V
Max.-Signal Driving Power (Approx.)	0	0	0	0	W
Max.-Signal Power Output (Approx.)	27	41	48	60	W

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:[k]

With fixed bias	30,000 max.	Ω
With cathode bias	Not recommended	

Footnotes for Ratings and Range Values

[g] See Section V.C. of 1CE-300.

[h] See Section V.B.1 of 1CE-300.

[i] See Section V.B.2 of 1CE-300.

[k] See Section V.C.1 of 1CE-300.

[m] Obtained preferably from a separate, well regulated source.

[n] Obtained from a fixed supply.

[p] See Section V.C.1a of 1CE-300.

[r] Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

[s] When grid No.1 is driven positive and the 6146A is operated at maximum ratings, the total dc grid-No.1-circuit resistance should not exceed the specified value of 30,000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply. For operation at less than maximum ratings, the dc grid-No.1 circuit resistance may be as high as 100,000 ohms.

[t] Obtained preferably from separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should be used only when the 6146A is used in a circuit which is not keyed. Grid-No.2 voltage must not exceed 400 volts under key-up conditions.

Typical Plate Characteristics

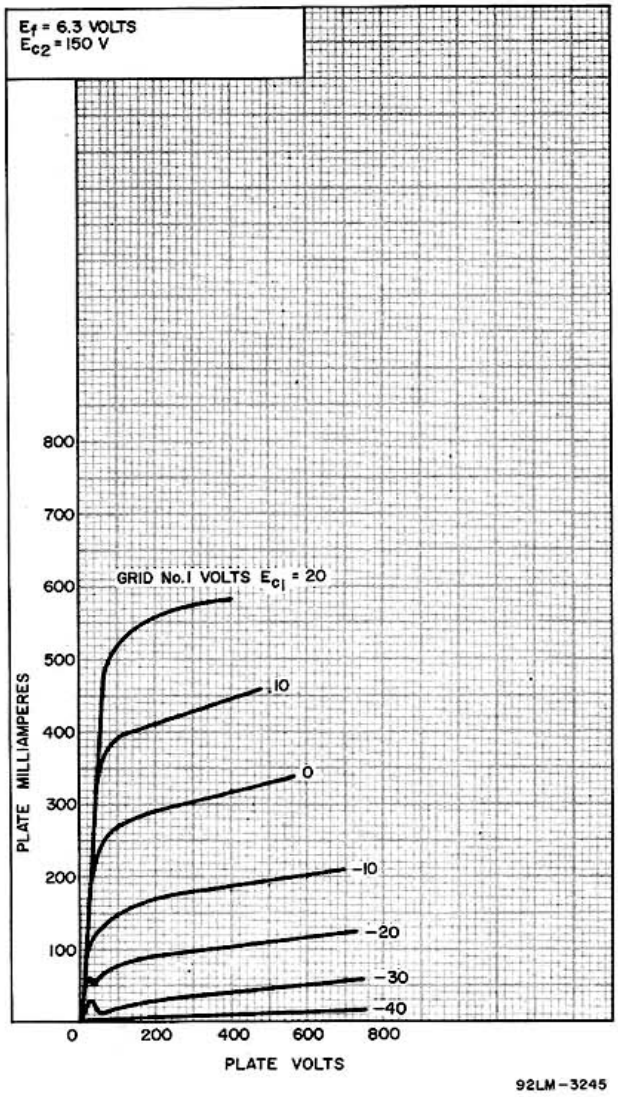


Figure 1

Typical Tube Characteristics

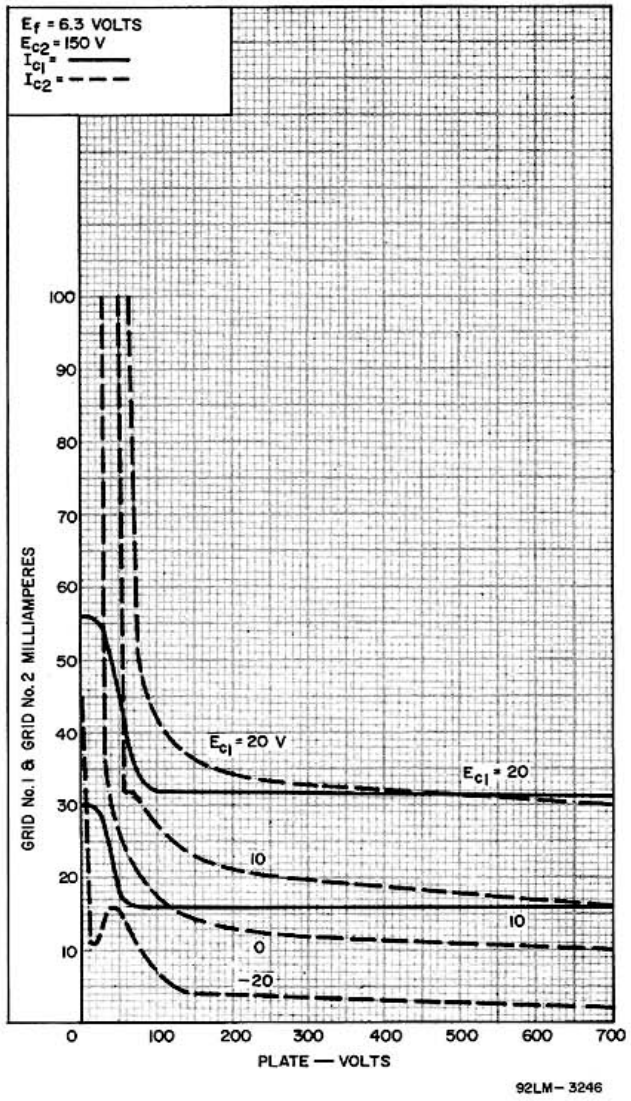


Figure 2

Typical Plate Characteristics

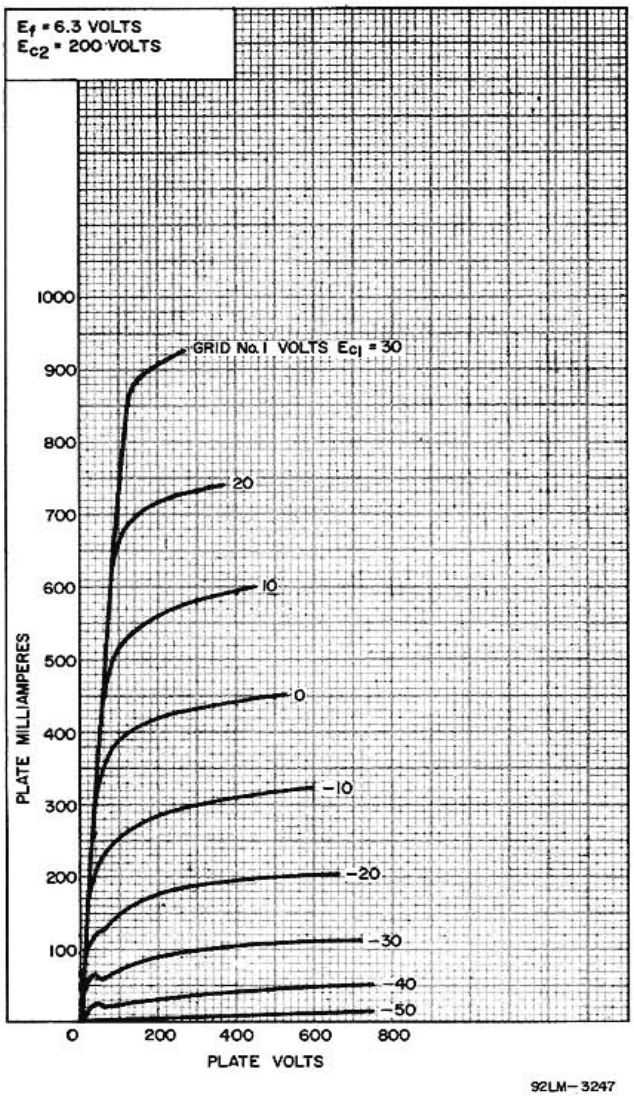


Figure 3

Typical Tube Characteristics

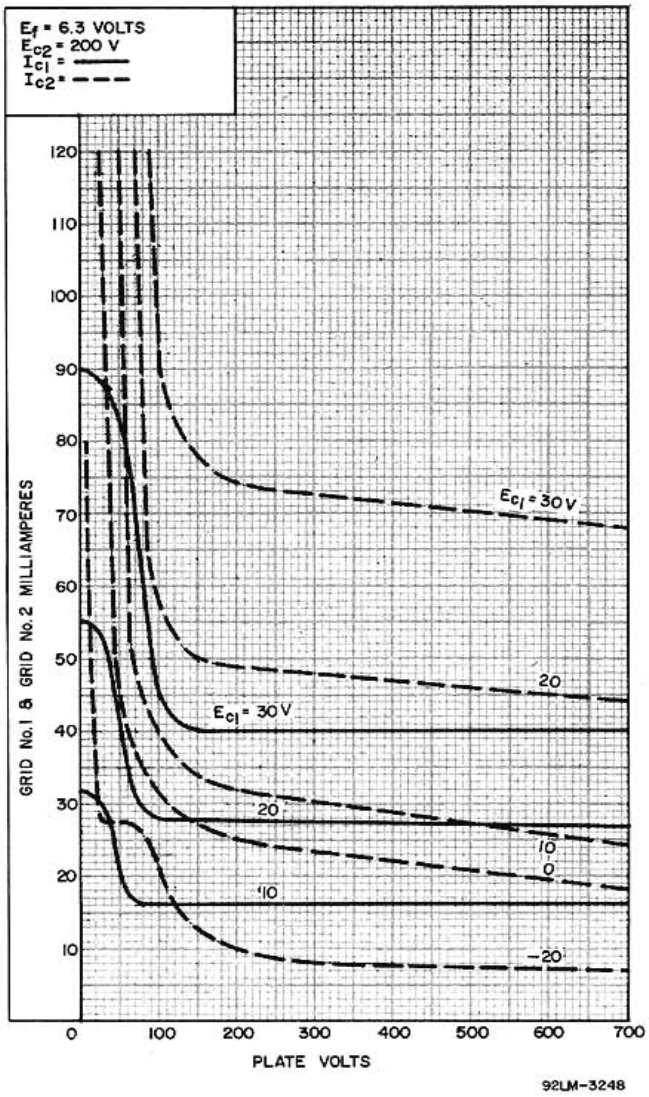


Figure 4

Maximum Ratings vs. Operating Frequency

Operating Frequency	Maximum Permissible Percentage of Maximum Rated Plate Voltage and Plate Input Class C Telephony Plate Modulated Class C Telegraphy Unmodulated	
	Voltage	Input
60	100	100
80	84	92
125	65	78
150	58	72
160	56	70
175	53	67

Characteristics Range Values

	Note	Min.	Max.	
1. Heater Current	v	1.175	1.325	A
2. Direct Interelectrode Capacitances:				
Grid No.1 to plate	—	—	0.24	pF
Grid No.1 to cathode	d	12.0	15.0	pF
Plate to cathode	d	7.3	9.5	pF
3. Plate Current	v,w	46	94	mA
4. Zero-Bias Plate Current	v,x	330	—	mA
5. Grid-No.2 Current	v,w	—	5.5	mA
6. Dynamic Grid-No.2 Current	v,y	3	21	mA
7. Useful Power Output I	v,y	47	—	W
8. Useful Power Output II	z		(See Note z)	

Plate-Modulated RF Power Amplifier – Class C Telephony[g]

Carrier conditions per tube for use with a max. modulation factor of 1.0; at frequencies up to 60 MHz.

Maximum Ratings, *Absolute-Maximum Values:*

	CCS	ICAS	
DC Plate Voltage[n]	480	600 max.	V
DC Grid-No.2 Voltage[i]	250	250 max.	V
DC Grid-No.1 Voltage	-150	-150 max.	V
DC Plate Current	117	125 max.	mA
DC Grid-No.1 Current	3.5	4.0 max.	mA
Plate Input	45	67.5 max.	W
Grid-No.2 Input	2	2 max.	W
Plate Dissipation	13.3	16.7 max.	W
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	135	135 max.	V
Heater positive with respect to cathode	135	135 max.	V

Typical Operation:

	CCS		ICAS	
DC Plate Voltage	400	475	600	V
DC Grid-No.2 Voltage[p]	150	135	150	V
From a series resistor of	33,000	51,000	56,000	Ω
DC Grid-No.1 Voltage[r]	-87	-77	-87	V
From a grid resistor of	27,000	27,000	27,000	Ω
Peak RF Grid-No.1 Voltage	107	95	107	V
DC Plate Current	112	94	112	mA
DC Grid-No.2 Current	7.8	6.4	7.8	mA
DC Grid-No.1 Current (Approx.)	3.4	2.8	3.4	mA
Driving Power[p] (Approx.)	0.4	0.3	0.4	W
Power Output (Approx.)	32	34	52	W

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance[s]	30,000 max.	Ω

RF Power Amplifier & Osc. – Class C Telegraphy[g] and RF Power Amplifier – Class C FM Telephony

Maximum Ratings, *Absolute-Maximum Values* up to 60 MHz:

	CCS	ICAS	
DC Plate Voltage[h]	600	750 max.	V
DC Grid-No.2 Voltage[i]	250	250 max.	V
DC Grid-No.1 Voltage	-150	-150 max.	V
DC Plate Current	140	150 max.	mA
DC Grid-No.1 Current	3.5	4.0 max.	mA
Plate Input	67.5	90 max.	W
Grid-No.2 Input	3	3 max.	W
Plate Dissipation	20	25 max.	W
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	135	135 max.	V
Heater positive with respect to cathode	135	135 max.	V

Typical Operation as Amplifier at 175 MHz:

	CCS	ICAS	
DC Plate Voltage	320	400	V
DC Grid-No.2 Voltage[t]	180	190	V
From a series resistor of	13,000	20,000	Ω
DC Grid-No.1 Voltage[u]	-51	-54	V
From a grid resistor of	27,000	24,000	Ω
From a cathode resistor of	330	330	Ω
Peak RF Grid-No.1 Voltage	64	68	V
DC Plate Current	140	150	mA
DC Grid-No.2 Current	10	10.4	mA
DC Grid-No.1 Current (Approx.)	2	2.2	mA
Driving Power (Approx.)	3	3	W
Power Output (Approx.)	25	35	W

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance	30,000 max.	Ω

[u] Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

[v] With 6.3 volts ac on heater.

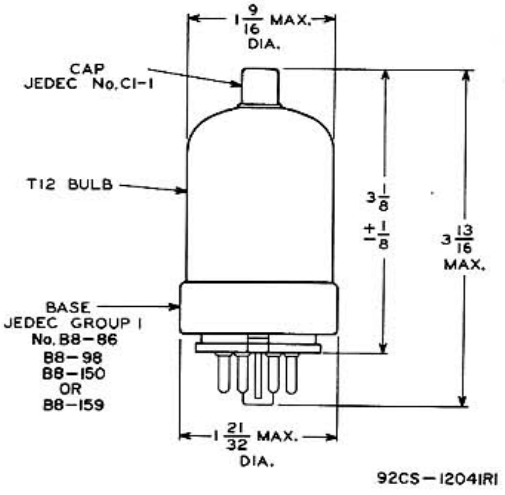
[w] With dc plate voltage of 300 volts, dc grid-No.2 voltage of 200 volts, and dc grid-No.1 voltage of -33 volts.

[x] With dc plate voltage of 100 volts, dc grid-No.2 voltage of 200 volts, and dc grid-No.1 voltage of -100 volts. Grid No.1 is square-wave pulsed at 1000 kc to zero volts. Limit value is peak-pulse current.

[y] In a single-tube, self-excited oscillator circuit, and with dc plate voltage of 600 volts, dc grid-No.2 voltage of 180 volts, grid-No.1 resistor of 30000 ± 10% ohms, dc plate current of 112 max. mA., dc grid-No.1 current of 2 to 2.5 mA., and frequency of 15 Mc.

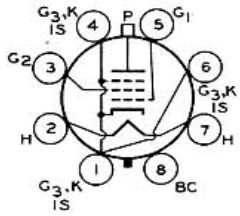
[z] With conditions in test No.7, reduce heater voltage to 5 volts. Useful power output shall be at least 90% of that at heater-voltage of 6.3 volts.

Dimensional Outline



Dimensions in Inches

Terminal Connections
Bottom View



Pin 1: Cathode, Grid No.3, Internal Shield
Pin 2: Heater
Pin 3: Grid No.2
Pin 4: Same as Pin 1
Pin 5: Grid No.1
Pin 6: Same as Pin 1
Pin 7: Heater
Pin 8: Base Sleeve
Cap: Plate