



**ELECTRONIC  
INNOVATIONS**  
IN ACTION

**TUBES**

# Beam Pentode

**6146-A**

**FOR POWER AMPLIFIER, OSCILLATOR,  
AND MODULATOR APPLICATIONS**

**HIGH POWER SENSITIVITY**

**T-12 BULB**

**90 WATTS CW INPUT (ICAS) UP TO 60 MC**

**OCTAL 8-PIN BASE**

The 6146-A is a beam pentode designed for use as a radio-frequency power amplifier and oscillator or as an audio-frequency power amplifier and modulator in mobile or fixed equipment. Featuring high power sensitivity the 6146-A may be operated with full input up to 60 megacycles and with reduced input to 175 megacycles.

The 6146-A incorporates triple-base-pin connections for the cathode and beam plates to permit effective r-f grounding, and an octal base with a metal sleeve having its own base-pin terminal. The sleeve, which shields the input to the tube and isolates it from the output circuit, eliminates the necessity for external shielding.

## GENERAL

### ELECTRICAL

**Heater Characteristics and Ratings**

Cathode-Coated Unipotential

Heater Voltage, AC or DC \* ..... 6.3 10% Volts

Heater Current • ..... 1.250 Amperes

**Direct Interelectrode Capacitances**

Grid-Number 1 to Plate, maximum ..... 0.24 pf

Input ..... 13.5 pf

Output ..... 8.5 pf

### MECHANICAL

Mounting Position - Any

Envelope - T-12, Glass

Base - B8-150, Small-Wafer Octal 8-Pin with Sleeve or  
B8-159, Small-Wafer Octal 8-Pin with External  
Barriers and Sleeve

Top Cap - C1-1 or C1-38

**Outline Drawing**

Maximum Diameter ..... 1.562 Inches

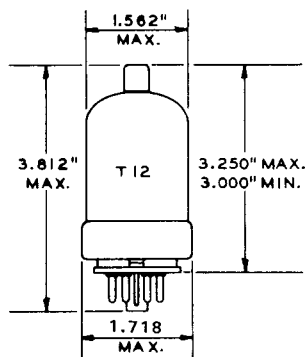
Maximum Over-all Length ..... 3.812 Inches

Maximum Seated Height ..... 3.250 Inches

Minimum Seated Height ..... 3.000 Inches

Bulb Temperature at Hottest Point ..... 220 °C

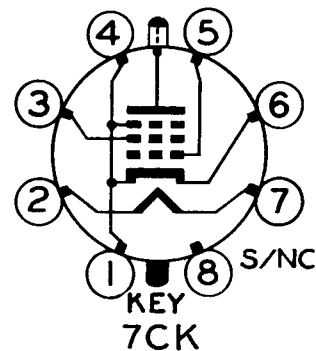
### PHYSICAL DIMENSIONS



### TERMINAL CONNECTIONS

- Pin 1 - Cathode, Beam Plates, and Internal Shield
- Pin 2 - Heater
- Pin 3 - Grid-Number 2 (Screen)
- Pin 4 - Cathode, Beam Plates, and Internal Shield
- Pin 5 - Grid-Number 1
- Pin 6 - Cathode, Beam Plates, and Internal Shield
- Pin 7 - Heater
- Pin 8 - Base Sleeve
- Cap - Plate

### BASING DIAGRAM



## CHARACTERISTICS MAXIMUM RATINGS AND TYPICAL OPERATION

### AVERAGE CHARACTERISTICS

Plate Voltage .....	200	Volts
Screen Voltage .....	200	Volts
Plate Current .....	100	Milliamperes
Transconductance .....	7000	Micromhos
Amplification Factor (Grid-Number 1 to Grid-Number 2) .....	4.5	

### AUDIO-FREQUENCY POWER AMPLIFIER AND MODULATOR—CLASS AB<sub>1</sub> MAXIMUM RATINGS ABSOLUTE-MAXIMUM VALUES

	CCS <sup>†</sup>	ICAS <sup>□</sup>	
DC Plate Voltage .....	600	750	Volts
DC Screen Voltage .....	250	250	Volts
Maximum-Signal DC Plate Current .....	125	135	Milliamperes
Maximum-Signal Plate Input .....	60	85	Watts
Maximum-Signal Screen Input .....	3.0	3.0	Watts
Plate Dissipation .....	20	25	Watts
Peak Heater-Cathode Voltage			
Heater Positive with Respect to Cathode .....	135	135	Volts
Heater Negative with Respect to Cathode .....	135	135	Volts

### TYPICAL OPERATION, VALUES FOR 2 TUBES

	400	500	600	600	750	
DC Plate Voltage .....	400	500	600	600	750	Volts
DC Screen Voltage .....	190	185	180	200	195	Volts
DC Grid Number 1 Voltage .....						
From Fixed Bias Source .....	-40	-40	-45	-50	-50	Volts
Peak AF Grid-Number 1-to-Grid Number 1 Voltage .....	80	80	90	100	100	Volts
Zero-Signal DC Plate Current .....	63	57	26	28	23	Milliamperes
Maximum-Signal DC Plate Current .....	228	215	200	229	220	Milliamperes
Zero-Signal DC Screen Current .....	2.5	2.0	1.0	1.0	1.0	Milliamperes
Maximum-Signal DC Screen Current .....	25	25	23	27	26	Milliamperes
Effective Plate-to-Plate Load Resistance .....	4000	5500	7000	6000	8000	Ohms
Maximum-Signal Power Output, approximate .....	55	70	82	95	120	Watts

### MAXIMUM CIRCUIT VALUES (CCS OR ICAS)

Grid Number 1 Circuit Resistance			
With Fixed Bias .....	0.1	0.1	Megohms
With Cathode Bias .....	Not Recommended	Not Recommended	

### AUDIO FREQUENCY POWER AMPLIFIER AND MODULATOR CLASS AB<sub>2</sub> MAXIMUM RATINGS ABSOLUTE-MAXIMUM VALUES

	600	750	
DC Plate Voltage .....	600	750	Volts
DC Screen Voltage .....	250	250	Volts
Maximum-Signal DC Plate Current .....	125	135	Milliamperes
Maximum-Signal Plate Input .....	62.5	90	Watts
Maximum-Signal Screen Input .....	3.0	3.0	Watts
Plate Dissipation .....	20	25	Watts
Peak Heater-Cathode Voltage			
Heater Positive with Respect to Cathode .....	135	135	Volts
Heater Negative with Respect to Cathode .....	135	135	Volts

AUDIO-FREQUENCY POWER AMPLIFIER AND MODULATOR CLASS AB<sub>2</sub>

(Continued)

TYPICAL OPERATION, VALUES FOR 2 TUBES	CCS <sup>†</sup>			ICAS <sup>□</sup>		
DC Plate Voltage	400	500	600	600	750	Volts
DC Screen Voltage <sup>▲</sup>	175	175	165	190	165	Volts
DC Grid-Number 1 Voltage						
From Fixed Bias Source	-41	-44	-44	-48	-46	Volts
Peak AF Grid-Number 1-to-Grid-Number 1 Voltage	95	102	97	109	108	Volts
Zero-Signal DC Plate Current	33	27	22	28	22	Milliamperes
Maximum-Signal DC Plate Current	232	242	207	270	240	Milliamperes
Zero-Signal DC Screen Current	1.1	0.7	0.6	1.2	0.3	Milliamperes
Maximum-Signal DC Screen Current	1.8	1.8	1.7	2.0	2.0	Milliamperes
Maximum-Signal DC Grid-Number 1 Current	1.6	1.9	1.1	2.0	2.6	Milliamperes
Effective Plate-to-Plate Load Resistance	3700	4600	6800	5000	7400	Ohms
Maximum-Signal Driving Power, approximate <sup>⊕</sup>	0.2	0.3	0.2	0.3	0.4	Watts
Maximum-Signal Power Output, approximate	6.2	8.3	9.0	113	131	Watts

## MAXIMUM CIRCUIT VALUES ( CCS OR ICAS )

Grid-Number 1 Circuit Resistance						
With Fixed Bias			0.3		0.3	Megohms
With Cathode Bias		Not Recommended			Not Recommended	

PLATE-MODULATED RADIO-FREQUENCY POWER AMPLIFIER-CLASS C TELEPHONY CARRIER CONDITIONS  
PER TUBE FOR USE WITH A MAXIMUM MODULATION FACTOR OF 1.0

## MAXIMUM RATINGS, ABSOLUTE VALUES

	CCS <sup>†</sup>		ICAS <sup>□</sup>	
DC Plate Voltage	480		600	Volts
DC Screen Voltage	250		250	Volts
DC Grid-Number 1 Voltage	-150		-150	Volts
DC Plate Current	117		125	Milliamperes
DC Grid-Number 1 Current	3.5		4.0	Milliamperes
Plate Input	4.5		67.5	Watts
Screen Input	2.0		2.0	Watts
Plate Dissipation	13.3		16.7	Watts
Peak Heater-Cathode Voltage				
Heater Positive with Respect to Cathode	135		135	Volts
Heater Negative with Respect to Cathode	135		135	Volts

## TYPICAL OPERATION

DC Plate Voltage	400	475	600	Volts
DC Screen Voltage <sup>†</sup>	150	135	150	Volts
From a Series Resistor of	33000	51000	56000	Ohms
DC Grid-Number 1 Voltage	-87	-77	-87	Volts
From a Grid Resistor of	27000	27000	27000	Ohms
Peak RF Grid-Number 1 Voltage	107	95	107	Volts
DC Plate Current	112	94	112	Milliamperes
DC Screen Current	7.8	6.4	7.8	Milliamperes
DC Grid-Number 1 Current, approximate	3.4	2.8	3.4	Milliamperes
Driving Power, approximate	0.4	0.3	0.4	Watts
Power Output, approximate	3.2	3.4	5.2	Watts

## MAXIMUM CIRCUIT VALUES (CCS OR ICAS)

Grid-Number 1 Circuit Resistance			
With Fixed Bias	0.3	0.3	Megohms
With Cathode Bias	Not Recommended	Not Recommended	

## RADIO-FREQUENCY POWER AMPLIFIER AND OSCILLATOR -CLASS C TELEPHONY AND RADIO FREQUENCY POWER AMPLIFIER - CLASS C FM TELEPHONY

### MAXIMUM RATINGS, ABSOLUTE VALUES

	CCS <sup>†</sup>	ICAS <sup>‡</sup>	
DC Plate Voltage	600	750	Volts
DC Screen Voltage	250	250	Volts
DC Grid-Number 1 Voltage	-150	-150	Volts
DC Plate Current	140	150	Milliamperes
DC Grid-Number 1 Current	3.5	4.0	Milliamperes
Plate Input	67.5	190	Watts
Screen Input	3.0	3.0	Watts
Plate Dissipation	20	25	Watts
Peak Heater-Cathode Voltage			
Heater Positive with Respect to Cathode	135	135	Volts
Heater Negative with Respect to Cathode	135	135	Volts

### TYPICAL OPERATION AS AMPLIFIER UP TO 60 MEGAHERTZ

DC Plate Voltage	500	600	600	750	Volts
DC Screen Voltage	170	150	180	160	Volts
From a Series Resistor of	36000	51000	43000	56000	Ohms
DC Grid-Number 1 Voltage †	-66	-58	-71	-62	Volts
From a Grid Resistor of	27000	20000	24000	20000	Ohms
From a Cathode Resistor of	470	470	430	470	Ohms
Peak RF Grid-Number 1 Voltage	84	73	91	79	Volts
DC Plate Current	135	112	150	120	Milliamperes
DC Screen Current	9.0	9.0	10	11	Milliamperes
DC Grid-Number 1 Current, approximate	2.5	2.8	2.8	3.1	Milliamperes
Driving Power, approximate	0.2	0.2	0.3	0.2	Watts
Power Output, approximate	48	52	66	70	Watts

### TYPICAL OPERATION AS AMPLIFIER UP TO 175 MEGAHERTZ

DC Plate Voltage	320		400		Volts
DC Screen Voltage	180		190		Volts
From a Series Resistor of	13000		20000		Ohms
DC Grid-Number 1 Voltage	-51		-54		Volts
From a Grid Resistor of	27000		24000		Ohms
From a Cathode Resistor of	330		330		Ohms
Peak RF Grid-Number 1 Voltage	64		68		Volts
DC Plate Current	140		150		Milliamperes
DC Screen Current	10		10.4		Milliamperes
DC Grid-Number 1 Current, approximate	2.0		2.2		Milliamperes
Driving Power, approximate	3.0		3.0		Watts
Power Output, approximate	25		35		Watts

## MAXIMUM CIRCUIT VALUES (CCS OR ICAS)

Grid-Number 1 Circuit Resistance	.03	.03	Megohm
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## INITIAL CHARACTERISTICS LIMITS

	MINIMUM	MAXIMUM	
Heater Current E <sub>f</sub> = 6.3 volts . . . . .	1175	1325	Milliamperes
Plate Current E <sub>f</sub> = 6.3 volts, E <sub>b</sub> = 300V, E <sub>c2</sub> = 200V, E <sub>c1</sub> = -33V . . . . .	46	94	Milliamperes
Screen Current E <sub>f</sub> = 6.3 volts, E <sub>b</sub> = 300V, E <sub>c2</sub> = 200V, E <sub>c1</sub> = -33V . . . . .	--	5.5	Milliamperes
Power Output E <sub>f</sub> = 6.3 volts, E <sub>b</sub> = 600V, E <sub>c2</sub> = 180V, R <sub>g1</sub> = 30,000 Ohms ±10%, I <sub>b</sub> = 100-112 Ma and I <sub>c1</sub> = 2 to 2.5 Ma. Measured in self-excited oscillator and circuit operating at 15 mhz . . . . .	47	--	Watts
Interelectrode Capacitances §			
Grid-Number 1 to Plate (g1 to p) . . . . .	--	0.24	μf
Input (g1 to k g3 I.S. Base Sleeve g2 h) . . . . .	11.1	15.9	μf
Output (p to k g3 I.S. Base Sleeve g2 h) . . . . .	6.4	10.6	μf

## NOTES

- \* The equipment designer should design the equipment so that heater voltage is centered at the specified bogey value, with heater supply variations restricted to maintain heater voltage within the specified tolerance.
- Heater current of a bogey tube at E<sub>f</sub> 6.3 volts.
- ◆ Continuous Commercial Service
- Intermittent Commercial and Amateur Service
- ▲ Obtained preferably from a separate source or from the plate voltage with a voltage divider.
- § Measured without external shield.
- ⊕ Driver stage should be capable of supplying the specified driving power at low distortion to the number 1 grids of the AB2 stage. To minimize distortion, the effective resistance per grid number 1 circuit of the AB2 stage should be held at low value. For this purpose the use of transformer coupling is recommended. In no case, however, should the total dc grid number 1 circuit resistance exceed 30,000 ohms when the tube is operated at maximum ratings. For operation at less than maximum ratings, the dc grid number 1 circuit resistance may be as high as 100,000 ohms.
- † Obtained preferably from a separate source modulated with the plate supply, or from the modulated plate supply through a series resistor.
- ‡ Obtained from grid number 1 resistor or from a combination of grid number 1 resistor with either fixed supply or cathode resistor.

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