



**ELECTRONIC
INNOVATIONS**
IN ACTION

TUBES

—PRODUCT INFORMATION—

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Beam Pentode

6146-A

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

HIGH POWER SENSITIVITY

90 WATTS CW INPUT (ICAS) UP TO 60 MC

T-12 BULB

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

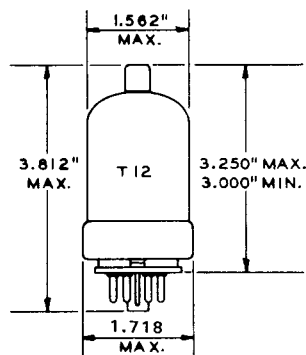
Maximum Over-all Length 3.812 Inches

Maximum Seated Height 3.250 Inches

Minimum Seated Height 3.000 Inches

Bulb Temperature at Hottest Point 220 °C

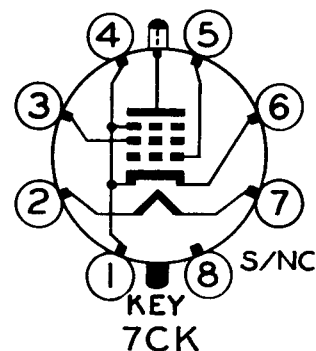
PHYSICAL DIMENSIONS



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 AB₁
MAXIMUM RATINGS ABSOLUTE-MAXIMUM VALUES**

	CCS [†]	ICAS [□]	
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

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 AB₂
MAXIMUM RATINGS ABSOLUTE-MAXIMUM VALUES**

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 AB₂

(Continued)

TYPICAL OPERATION, VALUES FOR 2 TUBES		CCS [†]			ICAS [□]		
DC Plate Voltage	400	500	600	600	750	Volts	
DC Screen Voltage ▲	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 ⊕	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 [†]		ICAS [□]	
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 †	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
 With Cathode Bias Not Recommended

0.3 Megohms
 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[†]ICAS[‡]

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 $\pm$	-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

INITIAL CHARACTERISTICS LIMITS

	MINIMUM	MAXIMUM	
Heater Current Ef = 6.3 volts	1175	1325	Milliamperes
Plate Current Ef = 6.3 volts, Eb = 300V, Ec2 = 200V, Ec1 = -33V	46	94	Milliamperes
Screen Current Ef = 6.3 volts, Eb = 300V, Ec2 = 200V, Ec1 = -33V	— —	5.5	Milliamperes
Power Output Ef = 6.3 volts, Eb = 600V, Ec2 = 180V, Rg1 = 30,000 Ohms $\pm 10\%$, Ib = 100–112 Ma and Ic1 = 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 Ef 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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