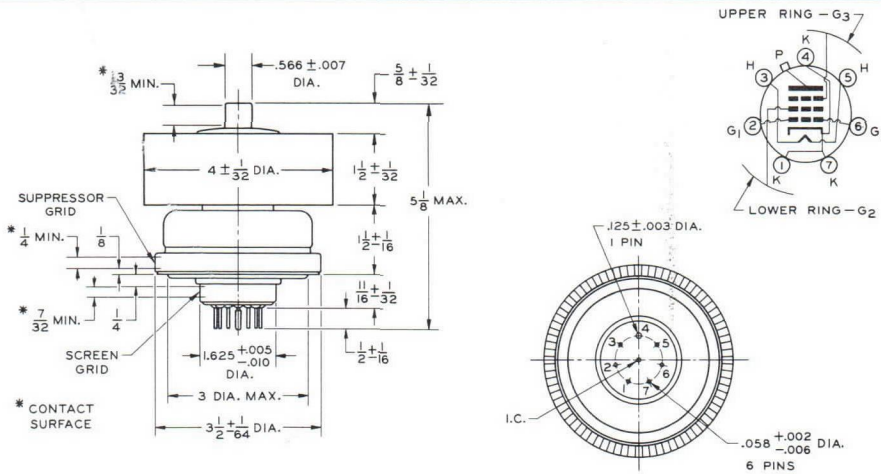


PL-8295

(PL-172)

Beam Pentode



DESCRIPTION

The PL-8295/PL-172 is a forced-air cooled, 1000-watt plate dissipation power pentode featuring high power gain and good efficiency at relatively low plate voltages. This tube is particularly well suited for low-distortion Class-AB₁ linear r-f amplifier service, where a single tube will deliver over 1500 watts of useful power output. The excellent characteristics of the PL-8295/PL-172 also provide outstanding performance in Class-AB₂, Class-B, and Class-C service.

ELECTRICAL CHARACTERISTICS

Cathode — Coated Unipotential

Heater Voltage	- - - - -	6.0 volts
Heater Current	- - - - -	8.2 amperes
Minimum Cathode Heating Time	- - - - -	3 minutes
Grid-Screen mu Factor	- - - - -	3.4
Transconductance (1000 v. Eb, 500 v. Ec ₂ , 1 a. Ib)	- - - - -	23,000 μmhos
Interelectrode Capacitances		
Grid-Plate	- - - - -	0.09 μμf
Input	- - - - -	38 μμf
Output	- - - - -	18 μμf

MECHANICAL CHARACTERISTICS

Base	- - - - -	7-pin Septar, EIA E 7-2
Base Connections	- - - - -	See base diagram
Recommended Socket	- - - - -	PL-184, PL-184A
Maximum Overall Dimensions		
Length	- - - - -	5.125 inches
Diameter	- - - - -	4.032 inches
Net Weight	- - - - -	3 pounds
Cooling		
Volume of air through cooler (at 1000 watts plate dissipation; 40°C max. incoming air temperature)	- - - - -	50 c.f.m., minimum
Pressure drop across cooler (at 50 c. f. m.)	- - - - -	0.15 in. water
Mounting Position	- - - - -	Any

1 October 1964

Form 92C-171E



THE PENTA LABORATORIES, INC.

A SUBSIDIARY OF RAYTHEON COMPANY

312 N. NOPAL STREET • SANTA BARBARA, CALIFORNIA 93102



PL-8295 / PL-172

MOUNTING

The PL-8295/PL-172 may be mounted in any position. When the tube is mounted with the axis vertical, it should be supported by either the lower edge or the upper flat portion of the suppressor grid terminal ring, or by the anode cooler. When mounted with the axis horizontal, the tube should be supported by the anode cooler. The tube must not be supported by the glass or pins at the base.

Contact to the suppressor and screen grid contact surfaces should be made by spring contact material in at least three places around the periphery of each surface.

The base of the PL-8295/PL-172 fits a standard seven-pin Septar socket, such as the E. F. Johnson Co. type 122-247 or 122-248. The socket should be located so that the glass at the base of the tube does not contact the socket when the tube is seated in its support.

Special sockets having air-directing means, and contacts for all base pins and screen and suppressor grid terminals are available. The PL-184 socket has built-in by-pass capacitors for the screen grid and suppressor grid. The type PL-184A socket has a built-in by-pass capacitor for the screen grid, but grounded suppressor-grid contacts.

COOLING

Minimum anode cooling requirements for the PL-8295/PL-172, together with air flow vs. pressure drop data, are given by the graph below. A small amount of cooling air (approximately 5 c. f. m.) should be diverted over the base end of the tube from the anode cooling supply, either before or after entering the anode cooler, to limit the temperature of the base seals and the screen grid and suppressor grid contact surfaces to a maximum of 175° C.

The pressure drop graph below refers only to the drop through the cooler. If additional pressure losses occur in the air system between the blower and the cooler, such as might occur in a socket or air duct, these losses must be added to the figure taken from the curve to determine the static pressure which must be maintained at the blower.

OPERATION — GENERAL

Maximum ratings and typical operating conditions for the PL-8295/PL-172 are given in the accompanying tabular data.

Heater voltage for the tube should be maintained as closely as possible to the rated value of 6.0 volts. Heater voltage variations up to 10 per cent are permissible, but decreased tube life and variations in power output may occur with prolonged operation at voltages more than 5 per cent from the rated value.

Screen-grid input in excess of the maximum rating can cause permanent damage to the PL-8295/PL-172. If screen voltage is obtained from a power supply separate from the plate voltage supply, the circuit should be arranged so that it is impossible to apply screen voltage

without plate voltage. The use of a screen-grid over-current relay is recommended, to remove screen voltage immediately in case of excessive screen current due to circuit maladjustment, grid bias failure, or accidental removal of plate circuit loading.

In Class AB₁ or AB₂ applications, grid bias voltage for the tube must be obtained from a fixed bias supply. The internal resistance of the bias source should not exceed 5000 ohms in Class AB₁ applications or 2000 ohms in Class AB₂ applications. Either fixed bias or cathode bias, or a combination of the two, is recommended for Class C applications. Partial grid leak bias, in combination with fixed or cathode bias, or both, may be used in Class C application, if desired, provided the total resistance of the grid leak plus the bias source does not exceed 5000 ohms.

Excellent performance may be obtained from the PL-8295/PL-172 with the suppressor grid operated at cathode potential. For maximum efficiency at high power input at low plate voltages, a positive voltage of about 35 volts should be applied to the suppressor grid. The actual value of suppressor voltage is not critical, and voltages between 25 and 45 volts may be used with only minor differences in performance. The internal resistance of the suppressor-grid voltage supply should not exceed 3000 ohms.

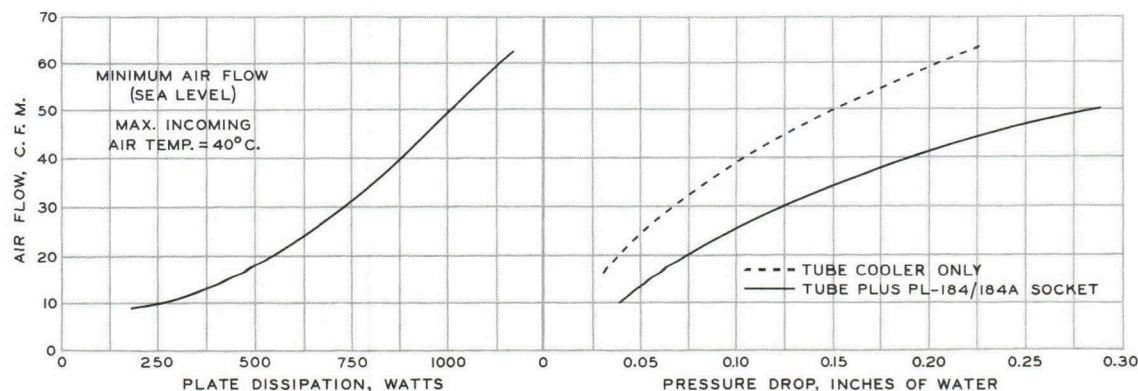
RADIO-FREQUENCY OPERATION

In most ordinary Class C applications, the PL-8295/PL-172 may be operated without neutralization, provided the suppressor and screen grids are effectively grounded for radio frequencies. In low-distortion Class AB₁ linear amplifier service, where reaction on the driver circuit must be entirely eliminated, it will usually be found advisable to neutralize the small feedback capacitance of the PL-8295/PL-172.

A metal chassis or equivalent means should be provided to separate the input and output circuits of an amplifier employing the PL-8295/PL-172. Reasonable precautions should be observed in regard to by-passing and shielding of the supply leads to prevent coupling between input and output through external circuits.

When it is desired to apply voltage to the suppressor grid of the tube, it is recommended that the suppressor grid by-pass capacitor, or capacitors, be located on the anode side of the chassis. The total suppressor-grid by-pass capacitance should be sufficient to result in a reactance of 3 ohms or less at the operating frequency. The d-c supply lead to the suppressor grid should either be located entirely on the anode side of the shielding, or fed through an effective r-f choke located well out of the field on the plate tank circuit and again by-passed before passing through the shielding into any compartment exposed to the control grid circuit.

For Class AB₁ linear amplifier service, the screen voltage for the PL-8295/PL-172 must be obtained from a well regulated source, to prevent excessive screen voltage variations due to the changes in screen current which occur between zero-signal and full-signal conditions.




MAXIMUM RATINGS
CCS (Continuous Commercial Service)

	<i>Class-C CW or FM</i>	<i>Class-AB₂ Audio or RF</i>	<i>Class-AB₁ Audio or RF</i>	
D-C Plate Voltage	3000	3000	3000	volts
D-C Screen-Grid Voltage	500	500	600	volts
D-C Suppressor-Grid Voltage	75	75	75	volts
D-C Control-Grid Voltage	-200			volts
D-C Plate Current	1000	800	800	ma.
D-C Control-Grid Current	10	10		ma.
Control-Grid Dissipation	5	5		watts
Screen-Grid Input	30	30	30	watts
Plate Dissipation	1000	1000	1000	watts

TYPICAL OPERATION — Class AB₁ Linear R-F Amplifier¹
Single-Sideband, Suppressed Carrier

D-C Plate Voltage	2000	2500	2500	3000	volts
D-C Screen Voltage	500	500	500	500	volts
D-C Suppressor-Grid Voltage	35	0	35	35	volts
D-C Control-Grid Voltage ²	-110	-115	-115	-115	volts
Zero-Signal D-C Plate Current	200	200	200	220	ma.
Zero-Signal D-C Screen Current	12	11	11	11	ma.
Maximum-Signal D-C Plate Current	800	800	800	800	ma.
Maximum-Signal D-C Screen Current	43	50	40	39	ma.
Maximum-Signal Peak R-F Grid Voltage	110	115	115	115	volts
Intermodulation Distortion Level ³					
Third Order	-26	-27	-27	-27	db
Fifth Order	-50	-45	-41	-45	db
Maximum-Signal Power Input	1600	2000	2000	2400	watts
Maximum-Signal Useful Power Output ⁴	1040	1140	1260	1590	watts

¹ D-C current values shown are for peak conditions, or for single-tone modulation at full signal.

² Approximate value; adjust to give stated zero-signal plate current.

³ At maximum output. Referenced against one tone of a two equal-tone signal. No degenerative feedback.

⁴ Single-tone or peak envelope power delivered to load from typical amplifier.

TYPICAL OPERATION — Class C C-W or FM Amplifier
Grounded-Cathode Circuit

D-C Plate Voltage	2000	2500	3000	volts
D-C Screen-Grid Voltage	500	500	500	volts
D-C Suppressor-Grid Voltage	35	35	35	volts
D-C Control-Grid Voltage	-175	-200	-200	volts
D-C Plate Current	850	840	820	ma.
D-C Screen-Grid Current	42	40	42	ma.
D-C Control-Grid Current	10	10	10	ma.
Peak R-F Grid Voltage (Approx.)	188	210	210	volts
Driving Power (Approx.)	1.9	2.1	2.1	watts
Plate Power Input	1700	2100	2460	watts
Useful Power Output ¹	1155	1440	1770	watts

¹ Actual power output delivered to load from typical amplifier.



PL-8295 / PL-172

