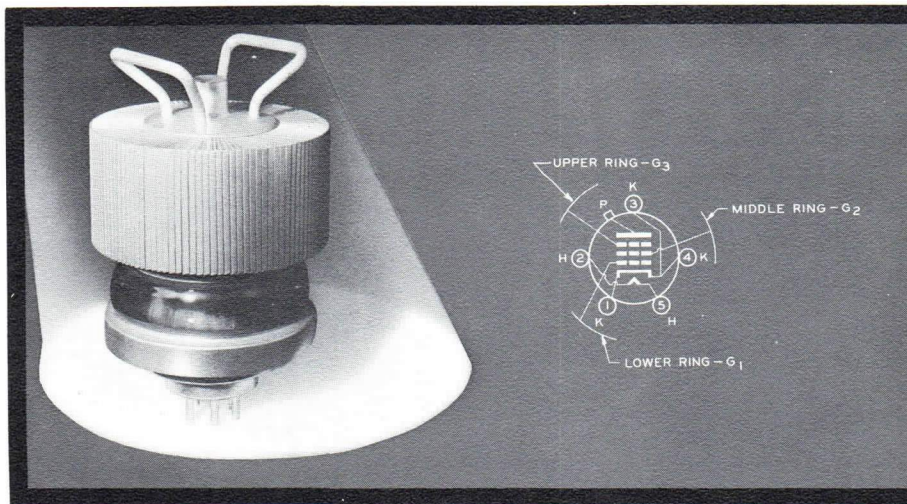




# PL-195

## Beam Pentode



### DESCRIPTION

The PL-195 is a forced-air cooled, 4000-watt plate dissipation beam pentode especially suited for low-distortion Class-AB<sub>1</sub> linear amplifier service, in which a single tube will deliver over 5000 watts of useful power output. The tube, which has a high power gain and good efficiency at relatively low plate voltages, is of the oxide-coated, unipotential-cathode type, with modest heater power requirements.

### ELECTRICAL CHARACTERISTICS

Cathode — Coated Unipotential

|                |           |            |
|----------------|-----------|------------|
| Heater Voltage | - - - - - | 6.0 volts  |
| Heater Current | - - - - - | 17 amperes |

|                              |           |           |
|------------------------------|-----------|-----------|
| Minimum Cathode Heating Time | - - - - - | 5 minutes |
|------------------------------|-----------|-----------|

|                                                                                           |           |                   |
|-------------------------------------------------------------------------------------------|-----------|-------------------|
| Transconductance (1500 v. E <sub>b</sub> , 750 v. E <sub>c2</sub> , 2 a. I <sub>b</sub> ) | - - - - - | 37,000 $\mu$ mhos |
|-------------------------------------------------------------------------------------------|-----------|-------------------|

Interelectrode Capacitances

Grounded-Cathode Circuit Configuration

|            |           |               |
|------------|-----------|---------------|
| Grid-Plate | - - - - - | 0.12 $\mu$ fd |
| Input      | - - - - - | 88 $\mu$ fd   |
| Output     | - - - - - | 33 $\mu$ fd   |

Grounded-Grid Circuit Configuration

|            |           |                |
|------------|-----------|----------------|
| Grid-Plate | - - - - - | 0.026 $\mu$ fd |
| Input      | - - - - - | 42 $\mu$ fd    |
| Output     | - - - - - | 34 $\mu$ fd    |

### MECHANICAL CHARACTERISTICS

|      |           |                 |
|------|-----------|-----------------|
| Base | - - - - - | 5-pin, EIA 5-97 |
|------|-----------|-----------------|

|                  |           |                  |
|------------------|-----------|------------------|
| Base Connections | - - - - - | See Base Diagram |
|------------------|-----------|------------------|

|                    |           |         |
|--------------------|-----------|---------|
| Recommended Socket | - - - - - | PL-205A |
|--------------------|-----------|---------|

Maximum Overall Dimensions

|        |           |             |
|--------|-----------|-------------|
| Length | - - - - - | 8.84 inches |
|--------|-----------|-------------|

|          |           |             |
|----------|-----------|-------------|
| Diameter | - - - - - | 5.53 inches |
|----------|-----------|-------------|

|            |           |           |
|------------|-----------|-----------|
| Net Weight | - - - - - | 11 pounds |
|------------|-----------|-----------|

Cooling\*

| <i>Plate Dissipation<br/>(Watts)</i> | <i>Air Flow<br/>(c.f.m.)</i> | <i>Pressure<br/>(Inches of Water)</i> |
|--------------------------------------|------------------------------|---------------------------------------|
| 3000                                 | 70                           | 0.26                                  |
| 4000                                 | 110                          | 0.45                                  |

\*At sea level, 50° C. maximum incoming air temperature. Pressure drop includes drop across PL-205A socket.

|                   |           |                                   |
|-------------------|-----------|-----------------------------------|
| Mounting Position | - - - - - | Axis vertical,<br>base up or down |
|-------------------|-----------|-----------------------------------|

10 April 1965

Form 92C-301C



## THE PENTA LABORATORIES, INC.

A SUBSIDIARY OF RAYTHEON COMPANY

312 N. NOPAL STREET • SANTA BARBARA, CALIFORNIA 93102



## MOUNTING

The PL-195 must be mounted with the axis of the tube vertical, with the base up or down, and must be supported by either the lower edge or the upper flat portion of the suppressor-grid terminal ring, or by the anode cooler. The tube must not be supported by the glass, by the pins, or by the control- or screen-grid rings.

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

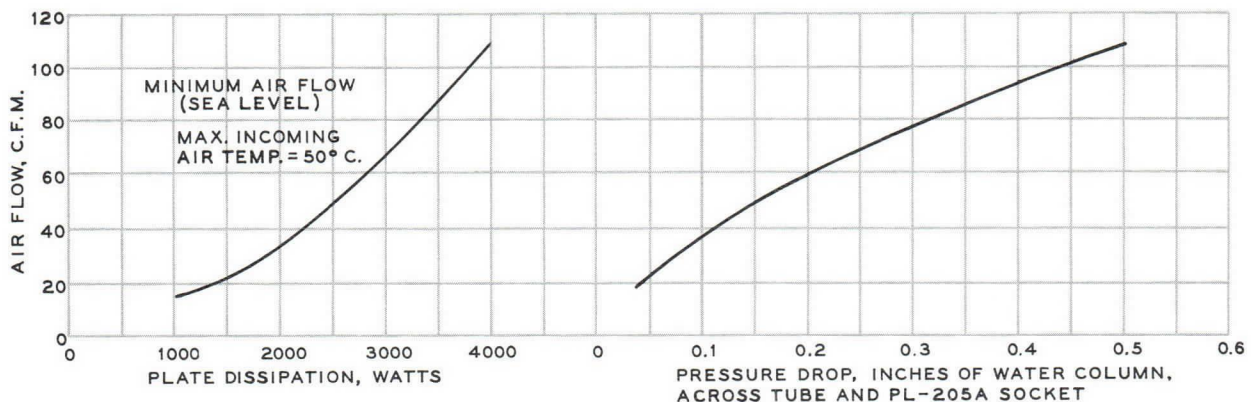
The base of the PL-195 fits a standard five-pin Jumbo socket, such as the E. F. Johnson Co. type 122-275. The socket should be so located that the glass at the base of the tube does not contact the socket when the tube is seated in its support.

The PL-205A, a special socket having air-directing provisions and contacts for all base pins and suppressor, screen and control-grid terminals, is available. The socket has built-in by-pass capacitors for the screen-grid, and the suppressor-grid contacts are grounded to the frame.

## COOLING

Cooling air requirements for the PL-195, when used with the Penta PL-205A socket, are shown in the graph below. Any additional pressure drops in the air system between the blower and socket, such as might occur in an air duct, must be added to the pressure drop figure taken from the chart to determine the static pressure which must be maintained at the blower.

Sufficient cooling air 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, suppressor, screen and control-grid contact surfaces to a maximum of 175° C. Adequate base-seal cooling is provided when the PL-195 is used with the PL-205A socket and a pressurized chassis, under the recommended tube cooling conditions.



## MAXIMUM RATINGS

### CCS (Continuous Commercial Service)

|                             |   |   |   |   |   |   |   |   |   |   |   |            |
|-----------------------------|---|---|---|---|---|---|---|---|---|---|---|------------|
| D-C Plate Voltage           | - | - | - | - | - | - | - | - | - | - | - | 5000 volts |
| D-C Screen-Grid Voltage     | - | - | - | - | - | - | - | - | - | - | - | 1000 volts |
| D-C Suppressor-Grid Voltage | - | - | - | - | - | - | - | - | - | - | - | 100 volts  |
| D-C Control-Grid Voltage    | - | - | - | - | - | - | - | - | - | - | - | -250 volts |
| D-C Plate Current           | - | - | - | - | - | - | - | - | - | - | - | 2.0 amp.   |
| Screen-Grid Input           | - | - | - | - | - | - | - | - | - | - | - | 75 watts   |
| Plate Dissipation           | - | - | - | - | - | - | - | - | - | - | - | 4000 watts |

## OPERATION - GENERAL

Maximum ratings and typical operating conditions for the PL-195 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. Voltage variations of up to 10 per cent are permissible, but decreased tube life and variations in power output may occur with prolonged operation at heater voltages of more than five per cent from the rated value.

Permanent damage to the PL-195 can be caused by screen-grid input in excess of the maximum rating. If screen voltage is obtained from a power supply separate from the plate voltage supply, the circuit should be so arranged 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.

Grid-bias voltage must be obtained from a fixed bias supply in Class-AB<sub>1</sub> or AB<sub>2</sub> applications. The total grid circuit resistance should not exceed 2,500 ohms.

## RADIO-FREQUENCY OPERATION

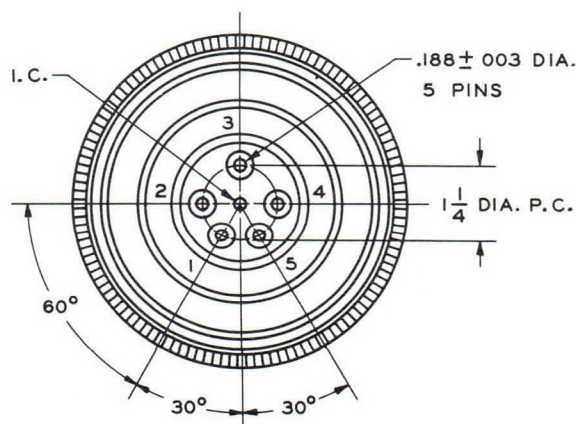
While the PL-195 may be operated without neutralization, provided the suppressor and screen-grids are effectively grounded for radio frequencies, it will usually be found advisable in low-distortion Class-AB<sub>1</sub> linear amplifier service, where reaction on the driver circuit must be eliminated, to neutralize the small feedback capacitance of the PL-195.

The input and output circuits of an amplifier using the PL-195 should be separated by a metal chassis or equivalent means. 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.

For Class-AB<sub>1</sub> linear amplifier service, the screen voltage for the PL-195 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.

|                                                     |      |      |      |       |
|-----------------------------------------------------|------|------|------|-------|
| D-C Plate Voltage                                   | 3000 | 4000 | 5000 | volts |
| D-C Screen-Grid Voltage                             | 750  | 750  | 750  | volts |
| D-C Suppressor-Grid Voltage                         | 0    | 0    | 0    |       |
| D-C Control-Grid Voltage <sup>1</sup>               | -104 | -105 | -105 | volts |
| Zero-Signal D-C Plate Current                       | 400  | 400  | 400  | ma.   |
| Maximum-Signal D-C Plate Current, Single Tone       | 1.47 | 1.55 | 1.65 | amp.  |
| Maximum-Signal D-C Plate Current, Two Tone          | 1.0  | 1.00 | 1.06 | amp.  |
| Zero-Signal D-C Screen-Grid Current                 | 9    | 8    | 7    | ma.   |
| Maximum-Signal D-C Screen-Grid Current, Single Tone | 75   | 65   | 65   | ma.   |
| Maximum-Signal D-C Screen-Grid Current, Two Tone    | 36   | 30   | 30   | ma.   |
| Maximum-Signal Peak R-F Control-Grid Voltage        | 104  | 105  | 105  | volts |
| Intermodulation Distortion Level <sup>2</sup>       |      |      |      |       |
| Third-Order                                         | -31  | -30  | -29  | db    |
| Maximum-Signal Useful Power Output <sup>3</sup>     | 2750 | 4000 | 5500 | watts |

<sup>3</sup>Single-tone or peak envelope power delivered to load from typical amplifier.



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