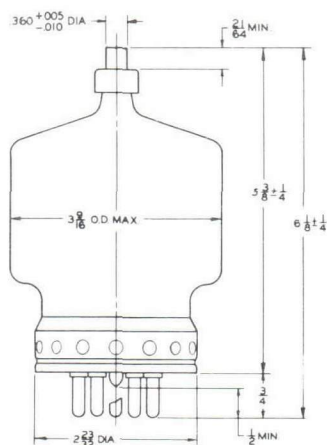


PL-8438/ 4-400A Power Tetrode



The Penta PL-8438/4-400A is a power tetrode with a maximum plate dissipation rating of 400 watts. Cooling is by radiation and by forced air through the base, along the envelope, and over the plate seal and radiator-type plate connector. The unique Penta ribbed-plate construction utilized in the PL-8438/4-400A provides a large effective plate radiating area, with minimum plate, screen-grid, and control-grid temperatures.

ELECTRICAL CHARACTERISTICS

Filament -- Thoriated Tungsten	
Voltage (± 5 per cent) - - - - -	5.0 volts
Current - - - - -	14.5 amperes
Grid-Screen mu factor - - - - -	5.1
Transconductance (2500 v. Eb, 500 v. Ec ₂ , 100 ma. Ib) - - - -	4000 μ mhos
Interelectrode Capacitances	
Grid-Plate - - - - -	0.12 μ f.
Input - - - - -	12.5 μ f.
Output - - - - -	4.5 μ f.
Maximum Frequency for Full Ratings - - - - -	110 Mc.

MECHANICAL CHARACTERISTICS

Base ¹ - - - - -	EIA A5-97
Basing - - - - -	EIA Type 5BK
Maximum Overall Dimensions	
Length - - - - -	6.38 inches
Diameter - - - - -	3.56 inches
Mounting Position - - - - -	Vertical, base up or down
Net Weight - - - - -	9.0 Ounces

¹ Recommended Socket -- Johnson 122-275, operated in conjunction with the PL-C1 glass chimney with socket cut-out as shown on page 3.

1 June 1964

Form 92C-61D



PENTA LABORATORIES, INC.

312 NORTH NOPAL STREET • SANTA BARBARA, CALIFORNIA



PL-8438/4-400A

COOLING

Forced air cooling of the base, base seals, envelope, plate seal, and plate connector is required for all classes of operation when the PL-8438/4-400A is operated at or near the maximum plate dissipation rating. A total quantity of 15 c.f.m. of cooling air, properly distributed to the base, envelope, and plate seal area, is required. Such cooling is most conveniently provided by means of a pressurized chassis upon which a standard tube socket is mounted in a special cut-out, in conjunction with a Penta PL-C1 air-control glass chimney. Proper dimensions for the socket cut-out to provide correct air distribution to the various portions of the tube are given on page 3 of this data sheet. Alternatively, a commercially available air-distribution type socket may be used with the PL-8438/4-400A.

When used with a socket cut-out as illustrated on page 3 and the PL-C1 chimney, the PL-8438/4-400A will be adequately cooled for operation at maximum ratings when the pressure within the sealed chassis is equal to 0.4 inch of water. At this pressure, the required 15 c.f.m. air flow will be obtained. Air at the proper pressure and quantity may be obtained from a small centrifugal blower rated at about 100 c.f.m. of free air. Cooling is adequate when the base seal temperatures do not exceed 200°C. and the plate seal temperature does not exceed 225°C.

When the plate dissipation does not exceed 250 watts, and when operation is at frequencies below 30 Mc., the tube may be operated without forced envelope or plate seal cooling. Under these circumstances, an air flow of 5 c.f.m. through the base alone is required, however.

RADIO-FREQUENCY OPERATION

The PL-8438/4-400A is especially suited for use as a radio-frequency power amplifier. The compact construction and low interelectrode capacitances permit operation at full ratings at frequencies as high as 110 Mc. Neutralization normally is not required for operation at frequencies below 30 Mc. At frequencies above

45 to 50 Mc. the feedback within the tube is substantially the result of screen-lead inductance. The effect of screen-lead inductance may be eliminated for a specified frequency of operation through the use of a variable capacitor as the screen-lead by-pass. The capacitor is tuned for minimum feedback of energy from the plate circuit to the grid circuit. A variable capacitor with a maximum capacitance of 50 μf . normally will be found adequate for operation in the 100-Mc region.

Under normal operating conditions the PL-8438/4-400A requires an unusually small amount of driving power. The high power sensitivity of the tube permits a reduction in the power requirements imposed upon the preceding driver stage, but requires that adequate precautions be taken to minimize the feedback of energy from the output circuit back to the input circuit of the tube.

AUDIO-FREQUENCY OPERATION

The high power sensitivity of the PL-8438/4-400A makes it well suited for use as an audio-frequency power amplifier or modulator in push-pull Class-AB₁ or Class-AB₂ service. In these classes of operation a pair of the tubes can give relatively high audio-frequency power output with low driving power and low harmonic distortion.

Under Class-AB₂ operating conditions, both grid bias and screen voltage must be obtained from a source having relatively good regulation. A series-connected string of voltage regulator tubes connected so as to regulate the output voltage of the screen-voltage supply normally will prove adequate. Grid-bias voltage may be obtained from batteries or from a power supply having a low resistance bleeder.

Under Class-AB₁ operating conditions, the d-c screen voltage must be obtained from a supply having good regulation, but the internal impedance of the grid-bias supply is not of critical importance. However, the effective grid-circuit resistance per tube must not exceed 250,000 ohms.

MAXIMUM RATINGS—CCS (Continuous Commercial Service)

(Frequencies below 110 Mc.)

	Class C FM or C.W.	Plate Mod. Class C	Class AB ₁ Audio Ampl.	Class AB ₂ Audio Ampl.
DC Plate Voltage	4000	3200	4000	4000 volts
D-C Screen Voltage	600	600	800	800 volts
D-C Grid Bias	-500	-500		volts
D-C Plate Current	350	275	350	350 ma.
Plate Dissipation	400	270	400	400 watts
Screen Dissipation	35	35	35	35 watts
Grid Dissipation	10	10	10	10 watts



PL-8438/4-400A

TYPICAL OPERATION—Class C CW or FM Amplifier (Frequencies below 75 Mc.)

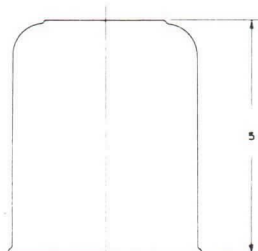
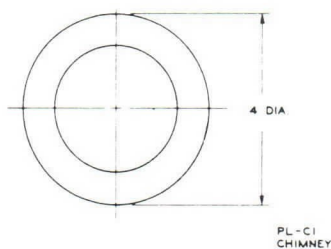
D-C Plate Voltage	2500	3000	4000	volts
D-C Screen Voltage	500	500	500	volts
D-C Grid Voltage	-200	-220	-220	volts
D-C Plate Current	350	350	350	ma.
D-C Screen Current	46	46	42	ma.
D-C Grid Current	18	18	19	ma.
Plate Dissipation	235	250	300	watts
Screen Dissipation	23	23	21	watts
Grid Dissipation	1.8	1.8	1.8	watts
Peak R-F Grid Voltage (approx.)	300	320	320	volts
Driving Power (at 20 Mc.)	5.5	5.9	6.0	watts
Plate Power Input	875	1050	1400	watts
Plate Power Output	640	800	1100	watts

Note: Driving power increases with operating frequency until at 75 Mc. approximately twice as much driving power as shown above will be required.

TYPICAL OPERATION—Class C Amplitude-Modulated Amplifier, Carrier Conditions

D-C Plate Voltage	2000	2500	3000	volts
D-C Screen Voltage	500	500	500	volts
D-C Grid Voltage	-220	-220	-220	volts
D-C Plate Current	275	275	275	ma.
D-C Screen Current	30	28	26	ma.
D-C Grid Current	12	12	12	ma.
Plate Dissipation	170	180	195	watts
Screen Dissipation	15	14	13	watts
Grid Dissipation	1.1	1.1	1.1	watts
Peak A-F Screen Voltage	350	350	350	volts
Peak R-F Grid Voltage (approx.)	290	290	290	volts
Driving Power (approx.)	3.5	3.5	3.5	watts
Plate Power Input	550	688	825	watts
Plate Power Output	380	508	630	watts

(Frequencies below 75 Mc.)



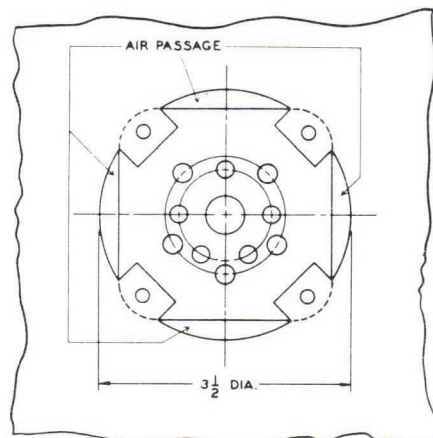
TYPICAL OPERATION—Class AB₁ A-F Power Amplifier or Modulator (Sine wave, two tubes)

D-C Plate Voltage	2500	3000	4000	volts
D-C Screen Voltage	750	750	750	volts
D-C Grid Voltage*	-130	-140	-150	volts
Zero Signal D-C Plate Current	190	160	120	ma.
Max.-Signal D-C Plate Current	635	610	585	ma.
Zero-Signal D-C Screen Current	0	0	0	ma.
Max.-Signal D-C Screen Current	28	30	40	ma.
Plate-to-Plate Load Resistance	6800	9000	14,500	ohms
Peak A-F Grid-to-Grid Signal	255	275	295	volts
Driving Power	0	0	0	watts
Max-Signal Plate Dissipation (per tube)	370	400	400	watts
Max.-Signal Plate Power Output	850	1100	1550	watts

TYPICAL OPERATION—Class AB₂ A-F Power Amplifier or Modulator (Sine wave, two tubes)

D-C Plate Voltage	2500	3000	4000	volts
D-C Screen Voltage	500	500	500	volts
D-C Grid Voltage*	-75	-80	-90	volts
Zero-Signal D-C Plate Current	190	160	120	ma.
Max.-Signal D-C Plate Current	700	700	640	ma.
Zero-Signal D-C Screen Current	0	0	0	ma.
Max.-Signal D-C Screen Current	50	40	32	ma.
Plate-to-Plate Load Resistance	7200	9000	14,000	ohms
Peak A-F Grid-to-Grid Signal	265	280	280	volts
Average Driving Power (Max. signal)	4.3	4.5	3.5	watts
Peak Driving Power (Max. signal)	9	10	8	watts
Max-Signal Plate Dissipation (per tube)	320	400	400	watts
Max-Signal Plate Power Output	1100	1380	1750	watts

*Note: Approximate values. Adjust to give the stated value of zero-signal plate current.



CHASSIS CUT-OUT AND SOCKET MOUNTING FOR PROPER AIR DISTRIBUTION FROM PRESSURIZED CHASSIS (JOHNSON NO. 122-275 SOCKET)



PL-8438/4-400A

