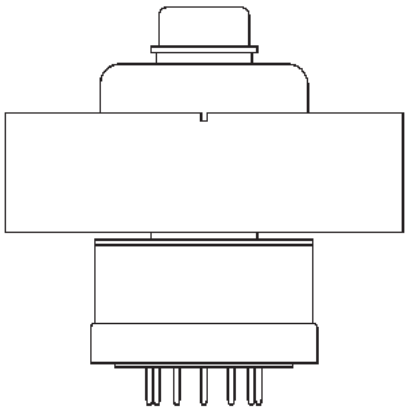


3CPX800A7

Hi-Mu

Power Triode

The Penta Laboratories 3CPX800A7 is a ceramic and metal power triode intended for use as a radio-frequency amplifier in FM broadcast applications. Operation with zero grid bias offers circuit simplicity by eliminating the bias supply. In addition, grounded-grid operation is attractive since a power gain as high as twenty times can be obtained with the 3CPX800A7. The slightly longer ceramic improves the maximum plate voltage capability while maintaining the same tuning characteristics as the 3CPX800A7.

General Characteristics[1]

Electrical

Cathode	Oxide coated, Unipotential	
Cathode Heater Voltage	13.5	Volts
Cathode Heater Current	1.5	Amperes
Amplification Factor (approximate)	200	
Direct Interelectrode Capacitances (grounded grid)[2]		
Cin	25.5	pF
Cout	6.1	pF
Cpk	0.04	pF
Highest Frequency for Maximum Ratings (CW)	500	MHz

Mechanical

Maximum Height	2.425	Inches
Maximum Diameter	2.530	Inches
Net Weight	12	Ounces
Operation Position	Any	
Maximum Operating Temperature		
Ceramic/Metal Seals	250°	C
Anode core	250°	C
Cooling	Forced-Air	
Base	Large Wafer Elevenar 11-pin with Ring	

Notes:

1. Characteristics and operating values are based upon performance tests. These figures may change without notice as the result of additional data or product refinement.
2. Capacitance values are for a cold tube as measured in a special shielded fixture in accordance with Electronic Industries Association Standard RS-191.

Revised 17 Nov 2022

P E N T A L A B O R A T O R I E S

14399 PRINCETON AVENUE * MOORPARK * CALIFORNIA 93021

(800) 421-4219 * (818) 882-3872 * FAX: (818) 882-3968

Typical Operation and Maximum Ratings

Radio Frequency Linear Amplifier
Class AB, Grounded Grid

Maximum Ratings

DC Plate Voltage	3500	Volts
DC Plate Current	0.6	Amperes
Plate Dissipation	800	Watts
Grid Dissipation	4	Watts

Typical Operation, CW (to 110 MHz) [1]

DC Plate Voltage	3200	Volts
Cathode Bias Voltage	18	Volts
Plate Current	0.43	Amperes
Grid Current[2]	25	mA
Driving Impedance	55	Ohms
Resonant Load Impedance	2850	Ohms
Driving Power (typical)	23	Watts
Output Power[2]	900	Watts
Power Gain (typical)	16	dB

Notes:
1. Typical operation data are obtained from direct measurement or by calculation from published characteristic curves. Adjustment of the rf grid voltage to obtain the specified plate current at the specified bias and plate voltages is assumed. If this procedure is followed, there will be little variation in power output when the tube is changed, even though there may be some variation in grid current. The grid current which results when the desired plate current is obtained is incidental and varies from tube to tube. These current variations cause no difficulty so long as the circuit maintains the correct voltage in the presence of the variations in current. If grid bias is obtained principally by means of a grid resistor, the grid resistor must be adjustable to obtain the required bias voltage when the correct rf grid voltage is applied.
2. Approximate values.

Application Notes

Mounting and Socketing - The 3CPX800A7 may be operated in any position. If it is to be operated in an inverted position (anode down) or horizontal position a suitable fixture or clamping device should be used to ensure reliable retention.

Cooling - Sufficient forced-air cooling must be provided to maintain the anode core and seal temperatures at a safe operating value. Cooling data are shown for incoming cooling air at 25°C and 50°C, and represent the minimum requirements to limit tube temperatures to 225°C. The pressure drop figures are approximate.

Cooling Air at 25°C

Plate Dissipation (Watts)	Sea Level Air Flow (CFM)	Sea Level Pressure Drop ($In.H_20$)	5000 Feet Air Flow (CFM)	5000 Feet Pressure Drop ($In.H_20$)
400	6	0.09	7	0.10
600	11	0.20	14	0.23
800	19	0.50	23	0.57

Cooling Air at 50°C

Plate Dissipation (Watts)	Sea Level Air Flow (CFM)	Sea Level Pressure Drop ($In.H_20$)	5000 Feet Air Flow (CFM)	5000 Feet Pressure Drop ($In.H_20$)
400	8	0.10	10	0.12
600	16	0.31	19	0.35
800	27	0.79	32	0.88

Some air flow across the tube base is required to maintain the base pin seals at a safe operating temperature. Typically this is done by blowing air through holes or cut-outs in the chassis, around the tube socket. These holes allow some rf leakage, but generally will not present any problems below the VHF region. Screening the holes will reduce the rf leakage to acceptable levels in most cases.

Cooling must be applied before, or simultaneously with, electrode voltages, including the heater, and may be removed simultaneously with them. In all cases temperature of the anode and the ceramic to metal seals is the limiting factor, The designer is encouraged to use temperature sensitive paint or other temperature sensing devices in connection with any equipment design before the layout is finalized. It should also be noted that it is not good practice to operate at, or close to, the absolute maximum temperature rating for the ceramic to metal seals. Where long life and consistent performance are factors cooling in excess of minimum requirements is normally beneficial.

Absolute Maximum Ratings - Values shown for the type of service are based on the "absolute system" and are not to be exceeded under any service conditions. These ratings are limiting values outside which serviceability of the tube may be impaired. In order not to exceed absolute maximum ratings the equipment designer has the responsibility of determining an average design value for each rating below the absolute value of that rating by a safety factor so the absolute values will never be exceeded under any usual conditions of supply-voltage variation, load variation, or manufacturing variation in the equipment itself. It does not necessarily follow that combinations of absolute maximum ratings can be attained simultaneously.

Heater/Cathode Operation - The rated heater voltage for the 3CPX800A7 is 13.5 volts, as measured at the base of the tube, and variations should be restricted to plus or minus 0.6 volt for long life and consistent performance.

Cathode Warm-up Time - In normal service it is recommended the heater voltage be applied for a minimum of three minutes before anode voltage and rf drive voltage are applied, to allow for proper conditioning of the cathode surface.

Input Circuit - When the 3CPX800A7 is operated as grounded-grid rf amplifier, the use of a resonant tank in the cathode circuit is recommended in order to obtain greatest linearity and power output. For best results with a single-ended amplifier, it is suggested that the cathode tank circuit operate at a "Q" of two or more.

Fault Protection - All power tubes operate at voltages which can cause severe damage in the event of an arc, especially in cases where large amounts of power supply stored energy are involved. Some means of protection is advised in all cases, and it is recommended that a series resistor be used in the lead from the power supply to the anode circuit to limit peak current and help dissipate the energy in the event of a tube or circuit arc. A resistance of 50 Ohms, with at least a 25 watt rating, in the plate power supply positive lead will help protect the tube in the event of an arc.

VHF Operation - The base pin connections to the grid may be used to 30 MHz. Above 30 MHz the use of a grid contact collet is recommended.

Interelectrode Capacitance - The actual internal interelectrode capacitance of a tube is influenced by many variables in most applications, such as stray capacitance to the chassis, capacitance added by the socket used, stray capacitance between tube terminals, and wiring effects. To control the actual capacitance values within the tube, as the key component involved, the industry and the Military Services use a standard test procedure as described in Electronic Industries Association Standard RS-191. This requires the use of specially constructed test fixtures which effectively shield all external tube leads from each other and eliminates any capacitance reading to "ground". The test is performed on a cold tube. Other factors being equal, controlling internal tube capacitance in this way normally assures good interchangeability of tubes over a period of time, even when the tube may be made by different manufactures. The capacitance values shown in the manufacture's technical data, or test specifications, normally are taken in accordance with Standard RS-191.

The equipment designer is therefore cautioned to make allowance for the actual capacitance values which will exist in any normal application. Measurements should be taken with the socket and mounting which represent approximate final layout if capacitance values are highly significant in the design.

High Voltage - The 3CPX800A7 operates at voltages which can be deadly, and the equipment must be designed properly and operating precautions must be followed. Equipment must be designed so that no one can come in contact with high voltages. All equipment must include safety enclosures for high-voltage circuits and terminals, with interlock switches to open the primary circuits of the power supplies and to discharge high-voltage condensers whenever access doors are opened. Interlock switches must not be bypassed or "cheated" to allow operation with access doors open. Always remember that **High Voltage Can Kill**.

RF Radiation - Avoid exposure to strong rf fields even at relatively low frequencies. Absorption of rf energy by human tissue is dependant on frequency. Under 300 MHz most of the energy will pass completely through the human body with little attenuation of heating affect. Public health agencies are concerned with hazards even at these frequencies. OSHA (Occupational Safety and Health Administration) recommends that prolonged exposure to rf radiation should be limited to 10 milliwatts per square centimeter.

Hot Surfaces - Air-cooled surfaces and other parts of the tube can reach temperatures of several hundred degrees C. Contact with these hot surfaces can cause serious burns if touched. These surfaces will remain hot for several minutes after all power is removed.

Operating Hazards

Proper use and safe operating practices with respect to power tubes are the responsibility of equipment manufactures and users of such tubes. All persons who work with and are exposed to power tubes, or equipment that utilize such tubes, must take precautions to protect themselves against possible serious bodily injury. Do not be careless around such products.

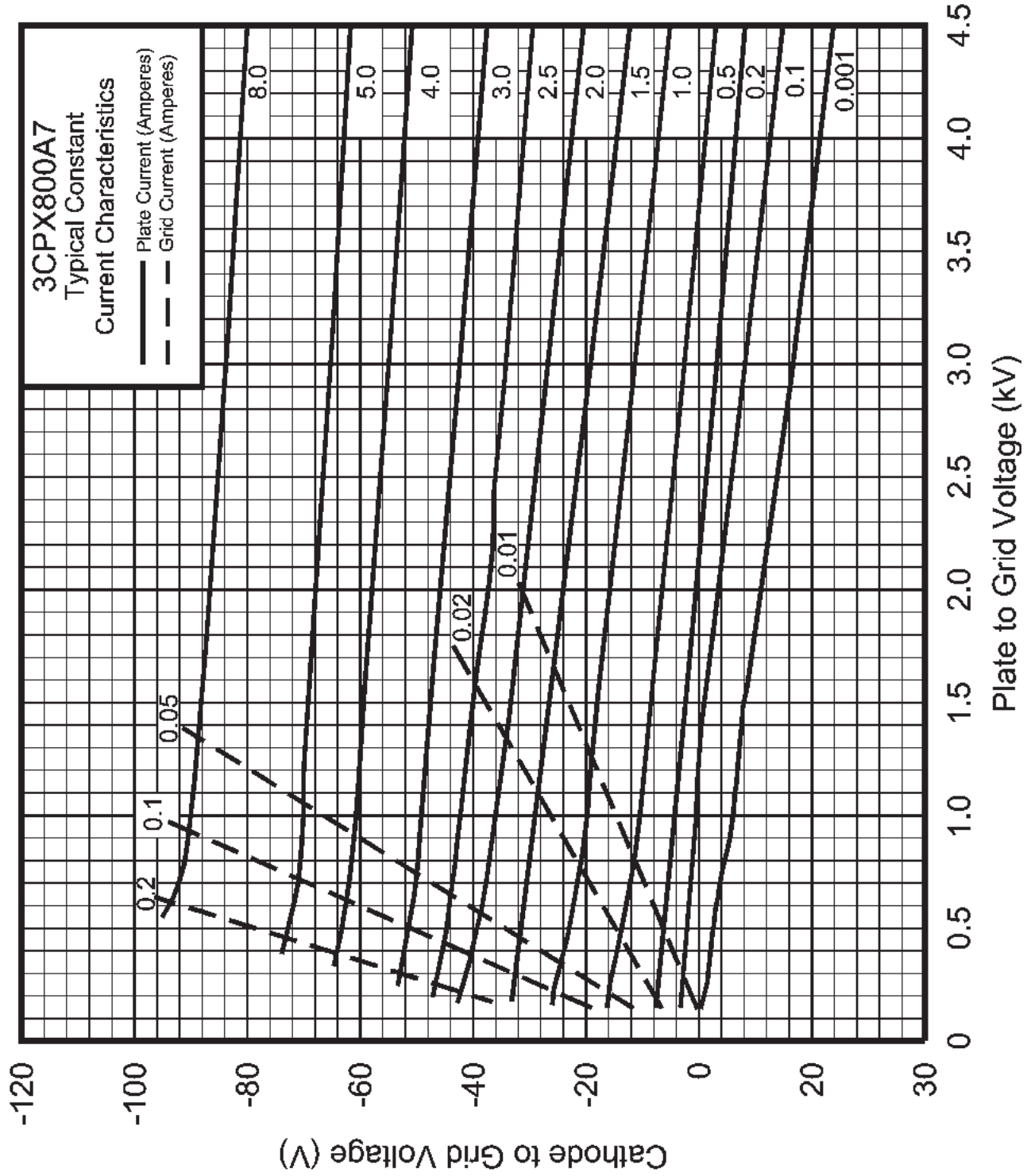
The operation of this tube may involve the following hazards, any one of which, in the absence of safe operating practices and precautions, could result in serious harm to personnel.

High Voltage - Normal operating voltages can be deadly. Remember that **High Voltage Can Kill**.

Low-Voltage High-Current Circuits - Personal jewelry, such as rings, should not be worn when working with filament contacts or connectors as a short circuit can produce very high current and melting, resulting in severe burns.

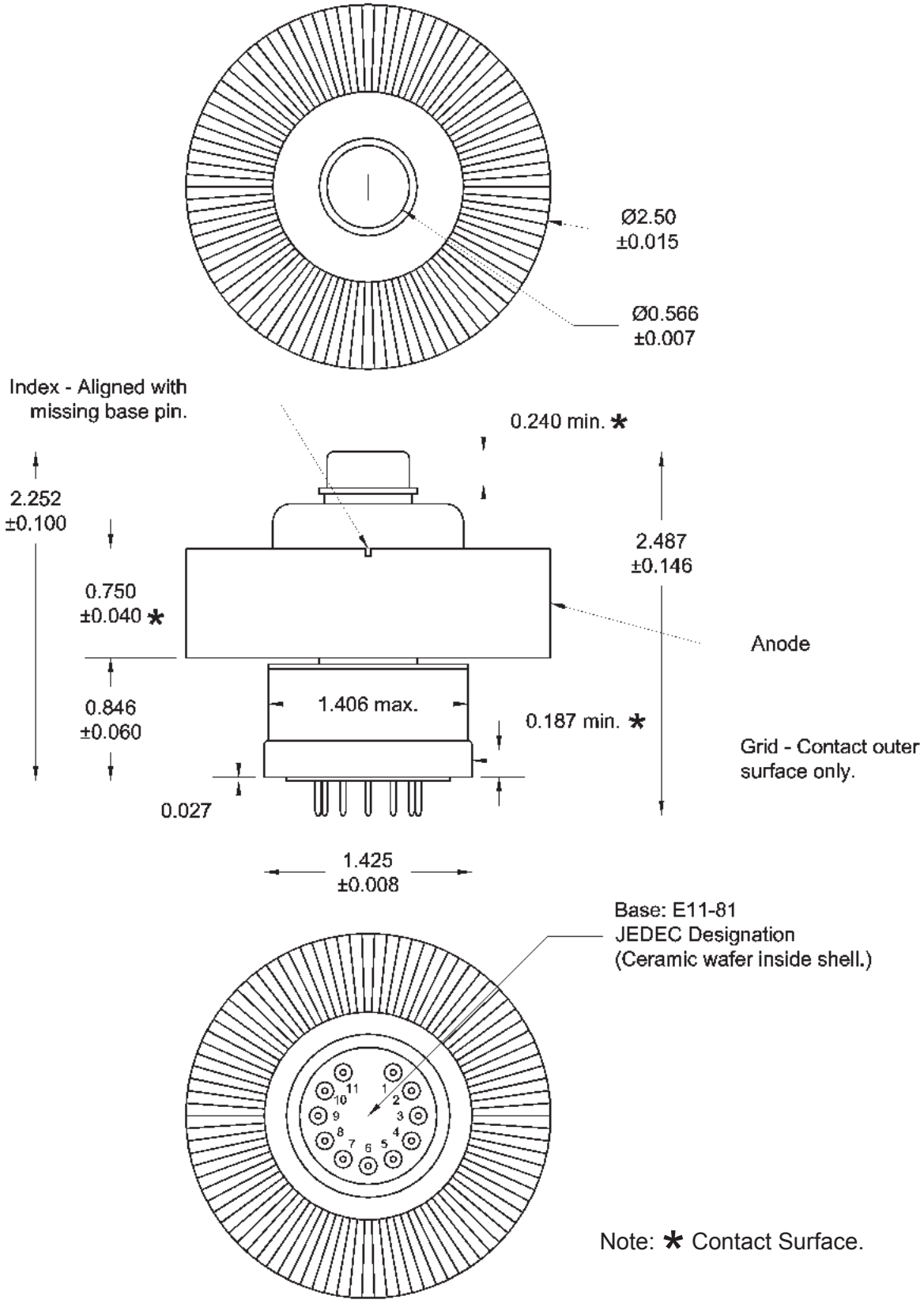
RF Radiation - Exposure to strong rf fields should be avoided, even at relatively low frequencies. The dangers of rf radiation are more severe at UHF and microwave frequencies and can cause serious bodily and eye injury. **Cardiac Pacemakers May Be Effected**.

Hot Surfaces - Air-cooled surfaces and other parts of the tube can reach temperatures of several hundred degrees C. Contact with these hot surfaces can cause serious burns if touched. These surfaces will remain hot for several minutes after all power is removed.



Dimensional Data

All dimensions in inches



Note: * Contact Surface.