

# PL5CX1500A

## Radial Beam Power Tetrode



The Penta PL5CX1500A is a ceramic / metal power pentode designed for use as a Class AB1 linear amplifier in audio or radio frequency applications. Its characteristic low intermodulation distortion makes it especially suitable for single sideband service. The filament is a rugged mesh type.

The tube is also recommended for use as a Class C rf power amplifier in CW, FM and AM service.

### ELECTRICAL

#### Filament: Thoriated Tungsten

Voltage .....	5.0+0.25	V
Current, at 5.0 volts .....	38.5	A

#### Transconductance (Average):

$I_b = 1.0 \text{ Adc}, E_c = 500 \text{ Vdc}$ .....	24,000	umhos
--	--------	-------

#### Amplification Factor (Average):

Grid to Screen .....	5.5
----------------------	-----

#### Direct Interelectrode Capacitance (grounded cathode)

Input .....	75	pF
Output .....	16.5	pF
Feedback .....	0.20	pF

#### Frequency of Maximum Rating:

CW .....	110	MHz
----------	-----	-----

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. Penta should be consulted before using this information for final equipment design.

2. Capacitance values are for a cold tube as measured in a shielded fixture.

### MECHANICAL

#### Maximum Overall Dimensions:

Length .....	5.150 in; 130.81 mm
Diameter .....	3.370 in; 85.60 mm

Net Weight .....	330 oz; 850.5 gm
------------------	------------------

Operating Position ..... Axis Vertical, base down or up

#### Maximum Operating Temperature:

Ceramic / Metal Seals .....	250°C
Anode Core .....	250°C

(Revised 12/06/94)



PENTA LABORATORIES

21113 SUPERIOR STREET \* CHATSWORTH \* CALIFORNIA 91311  
(800) 421-4219 \* (818) 882-3872 \* FAX: (818) 882-3968

ELECTRON TUBES FOR INDUSTRY



## PL5CX1500A Radial Beam Power Tetrode

Cooling ..... Forced Air  
Base ..... Special ring and breechblock surfaces

### RADIO FREQUENCY LINEAR AMPLIFIER GRID DRIVEN Class AB1

#### Absolute Maximum Ratings:

DC Plate Voltage .....	4000	volts
DC Screen Voltage .....	750	volts
DC Plate Current .....	1.0	ampere
Plate Dissipation .....	1500	watts
Suppressor Dissipation .....	25	watts
Screen Dissipation .....	75	watts
Grid Dissipation .....	25	watts

1. Adjust to specified zero-signal dc plate current.
2. The intermodulation distortion products are referenced against one tone of a two equal tone signal.
3. Approximate values.

#### Typical Operation (Frequencies to 30 MHz)

Class AB1, Grid Driven

Plate Voltage .....	2500	3000	4000	Vdc
Suppressor Voltage .....	0	0	0	Vdc
Screen Voltage .....	500	500	500	Vdc
Grid Voltage <sup>1</sup> .....	-87	-89	-90	Vdc
Zero-Signal Plate Current .....	250	250	250	mAdc
Single-Tone Plate Current .....	660	690	690	mAdc
Two-Tone Plate Current .....	470	480	485	mAdc
Single-Tone Screen Current <sup>3</sup> .....	79	71	59	mAdc
Two-Tone Screen Current <sup>3</sup> .....	36	32	25	mAdc
Peak rf Grid Voltage <sup>3</sup> .....	87	89	90	v
Peak Driving Power <sup>3</sup> .....	0	0	0	w
Single-Tone Useful				
Output Power .....	1090	1330	1785	W
Resonant Load Impedance .....	2340	2680	3500	
Intermodulation Distortion Product <sup>2</sup>				
3rd Order .....	-38	-36	-33	db
5th Order .....	-39	-41	-42	db

#### RADIO FREQUENCY POWER AMPLIFIER OR OSCILLATOR

Class C Telegraphy of FM (Key-Down Conditions)

#### Absolute Maximum Ratings:

DC PLate Voltage .....	5000	Volts
DC Screen Voltage .....	750	Volts
DC Plate Current .....	1.0	Ampere
Plate Dissipation .....	1500	Watts
Suppressor Dissipation .....	25	Watts
Screen Dissipation .....	75	Watts
Grid Dissipation .....	25	Watts



## PL5CX1500A Radial Beam Power Tetrode

### Typical Operation (Frequencies to 30 MHz)

Plate Voltage .....	3000	4000	4500	Vdc
Suppressor Voltage .....	0	0	0	Vdc
Screen Voltage .....	500	500	500	Vdc
Grid Voltage .....	-200	-200	-200	Vdc
Plate Current .....	900	800	900	mAdc
Screen Current <sup>1</sup> .....	94	66	88	mAdc
Grid Current <sup>1</sup> .....	35	25	34	mAdc
Peak rf Grid Voltage <sup>1</sup> .....	255	245	255	v
Calculated Driving Power .....	9.0	6.5	9.5	W
Plate Input Power .....	2700	3200	4050	W
Plate Dissipation .....	720	850	870	W
Plate Output Power .....	1980	2350	3180	W
Resonant Load Impedance .....	1570	2240	2520	

1. Approximate Value

### PLATE MODULATED RADIO FREQUENCY POWER AMPLIFIER-GRID DRIVEN

Class C Telephony (Carrier Conditions)

#### Absolute Maximum Ratings:

DC Plate Voltage .....	3500	Volts
DC Screen Voltage .....	550	Volts
DC Plate Current .....	0.8	Ampere
Plate Dissipation <sup>1</sup> .....	1000	Watts
Suppressor Dissipation .....	25	Watts
Screen Dissipation <sup>2</sup> .....	75	Watts
Grid Dissipation <sup>2</sup> .....	25	Watts

1. Corresponds to 1500 watts at 100% sine-wave modulation.

2. Average, with or without modulation.

### Typical Operation (Frequencies to 30 MHz)

Plate Voltage .....	2500	3200	Vdc
Suppressor Voltage .....	0	0	Vdc
Screen Voltage .....	500	500	Vdc
Grid Voltage .....	-260	-260	Vdc
Plate Current .....	800	800	mAdc
Screen Current <sup>1</sup> .....	90	86	mAdc
Grid Current <sup>1</sup> .....	32	32	mAdc
Peak af Screen Voltage <sup>1</sup> (100% Modulation) .....	500	500	v
Peak rf Grid Voltage <sup>1</sup> .....	315	315	v
Calculated Driving Power .....	10	10	W
Plate Input Power .....	2000	2560	W
Plate Dissipation .....	530	576	W
Plate Output Power .....	1470	1958	W
Resonant Load Impedance .....	1360	1863	

1. Approximate value.



## PL5CX1500A Radial Beam Power Tetrode

### AUDIO FREQUENCY POWER AMPLIFIER OR MODULATOR

Class AB, Grid Driven (Sinusoidal Wave)

#### Absolute Maximum Ratings (per tube)

DC Plate Voltage .....	4000	Volts
DC Screen Voltage .....	750	Volts
DC Plate Voltage .....	1.0	Ampere
Plate Dissipation .....	1500	Watts
Suppressor Dissipation .....	25	Watts
Screen Dissipation .....	75	Watts
Grid Dissipation .....	25	Watts

#### Typical Operation (Two Tubes)

Plate Voltage .....	2800	3800	Vdc
Suppressor Voltage .....	0	0	Vdc
Screen Voltage .....	500	500	Vdc
Grid Voltage .....	-81	-83	Vdc
Zero-Signal Plate Current .....	0.50	0.50	Adc
Max. Signal Plate Current .....	1.30	1.33	Adc
Zero-Signal Screen Current .....	20	20	mAdc
Max. Signal Screen Current .....	110	106	mAdc
Peak af Grid Voltage .....	81	83	v
Peak Driving Power .....	0	0	w
Max. Signal Plate Dissipation .....	720	1130	W
Plate Output Power .....	2200	3220	W
Load Resistance (plate to plate) .....	4800	6720	

RANGE VALUES FOR EQUIPMENT DESIGN	MIN.	MAX.	
Filament: Current at 5.0 volts .....	36.5	40.5	A
Interelectrode Capacitances (grounded cathode connection)			
Input .....	70	80	pF
Output .....	14.5	18.5	pF
Feedback .....	—	0.25	pF
Interelectrode Capacitances (grounded grid connection)			
Input .....	32	37	pF
Output .....	14.5	18.5	pF
Feedback .....	—	0.05	pF

## APPLICATION

### MECHANICAL

*Mounting* - The 5CX1500A must be operated with its axis vertical. The base of the tube may be up or down at the convenience of the circuit designer.

*Socket* - The Penta SK-840 socket and SK-806 chimney have been designed especially for the 5CX1500A. The use of recommended air-flow rates through these sockets provides effective forced-air cooling of the tube. Air forced into the bottom of the socket passes over the tube



## PL5CX1500A Radial Beam Power Tetrode

terminals through the Air Chimney, and exits through the anode cooling fins.

*Cooling* - The maximum temperature rating for the anode core of the 5CX1500A is 2500C. Sufficient forced-air circulation must be provided to keep the temperature of the anode at the base of the cooling fins and the temperature of the ceramic / metal seals below 2500C. Air-flow requirements to maintain seal temperature at 2250C in 500C ambient air are tabulated below (for operation below 30 MHz).

PLATE DISSIPATION (WATTS)	SEA LEVEL		6000 FEET	
	AIR FLOW (CFM)	PRESSURE DROP (INCHES OF WATER)	AIR FLOW (CFM)	PRESSURE DROP (INCHES OF WATER)
1000	27	.33	33	.40
1500	47	.76	58	.95

The blower selected in a given application must be capable of supplying the desired air flow at a back pressure equal to the pressure drop shown above plus any drop encountered in ducts and filters.

*At other altitudes and ambient temperatures the flow rate must be modified to obtain equivalent cooling.* The flow rate and corresponding pressure differential must be determined individually in such cases, using rated maximum temperatures as the criteria for satisfactory cooling.

### ELECTRICAL

*Filament Operation* - The rated filament voltage for the 5CX1500A is 5.0 volts. Filament voltage, as measured at the socket, should be maintained within +5% of this value or below to obtain maximum tube life.

*Grid Operation* - The rated dissipation of the grid is 25 watts. This is approximately the product of DC grid current and peak positive grid voltage. Operation at bias and drive levels near those listed will insure safe operation.

*Intermodulation Distortion* - The Radio Frequency

Linear Amplifier operating conditions including distortion data are the results of operation in a neutralized, grid-driven amplifier.

*Screen Operation* - The power dissipated by the screen of the 5CX1500A must not exceed 75 watts.

Screen dissipation, in cases where there is no ac applied to the screen, is the simple product of the screen voltage and screen current. If the screen voltage is modulated, the screen dissipation will depend upon rms screen current and voltage.

Screen dissipation is likely to rise to excessive values when the plate voltage, bias voltage, or plate load are removed with filament and screen voltages applied. Suitable protective means must be provided to limit the screen dissipation to 75 watts in the event of circuit failure.

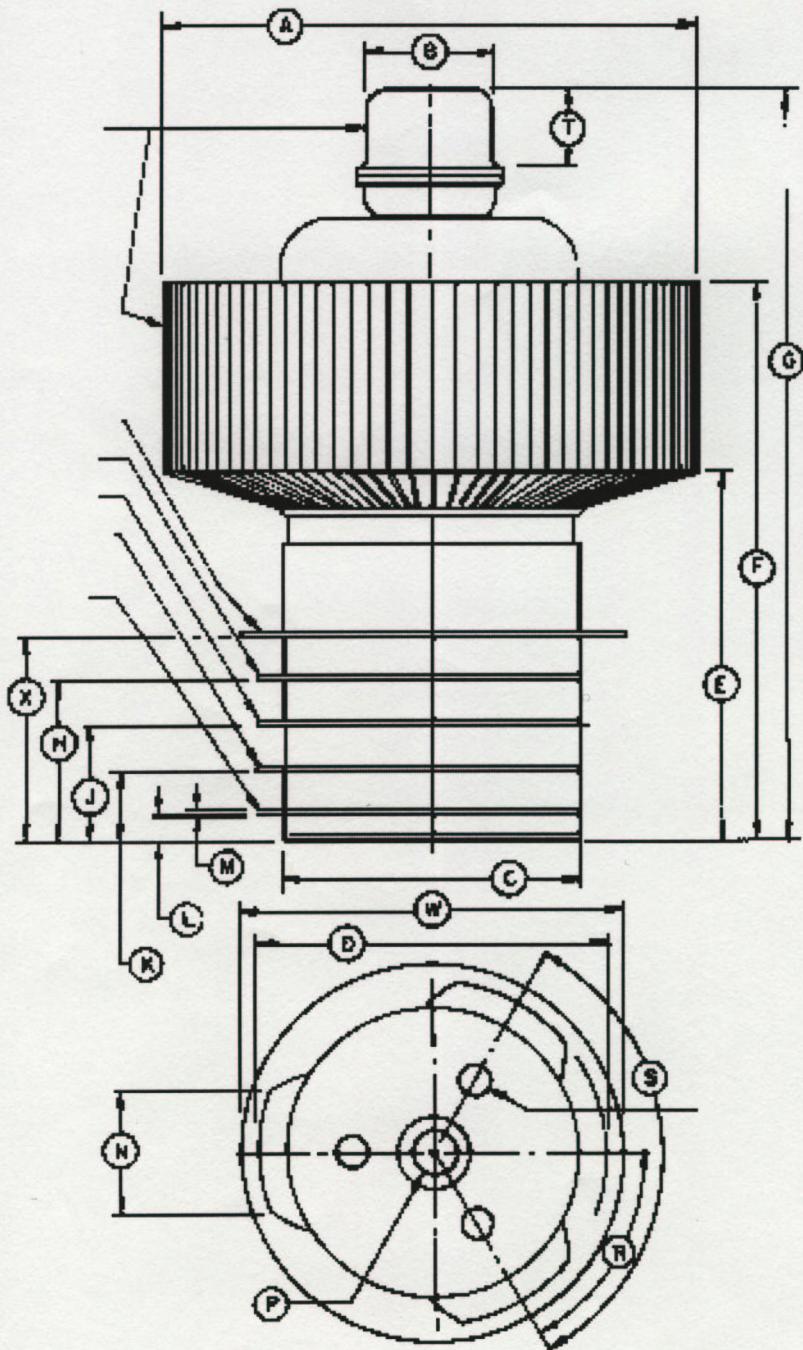
*Plate Dissipation* - The plate dissipation ratings for the 5CX1500A is 1000 watts for Class-C plate-modulated service and 1500 watts for Class-C telegraphy. In Class-AB service the plate dissipation rating is 1500 watts.

*Suppressor Operation* - The rated dissipation of the suppressor is 25 watts. Suppressor current will be zero or very nearly zero for all typical operating conditions specified. The 5CX1500A has been designed for zero voltage operation of the suppressor grid for most applications.

*High Voltage* - The 5CX1500A 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 interlocking 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.

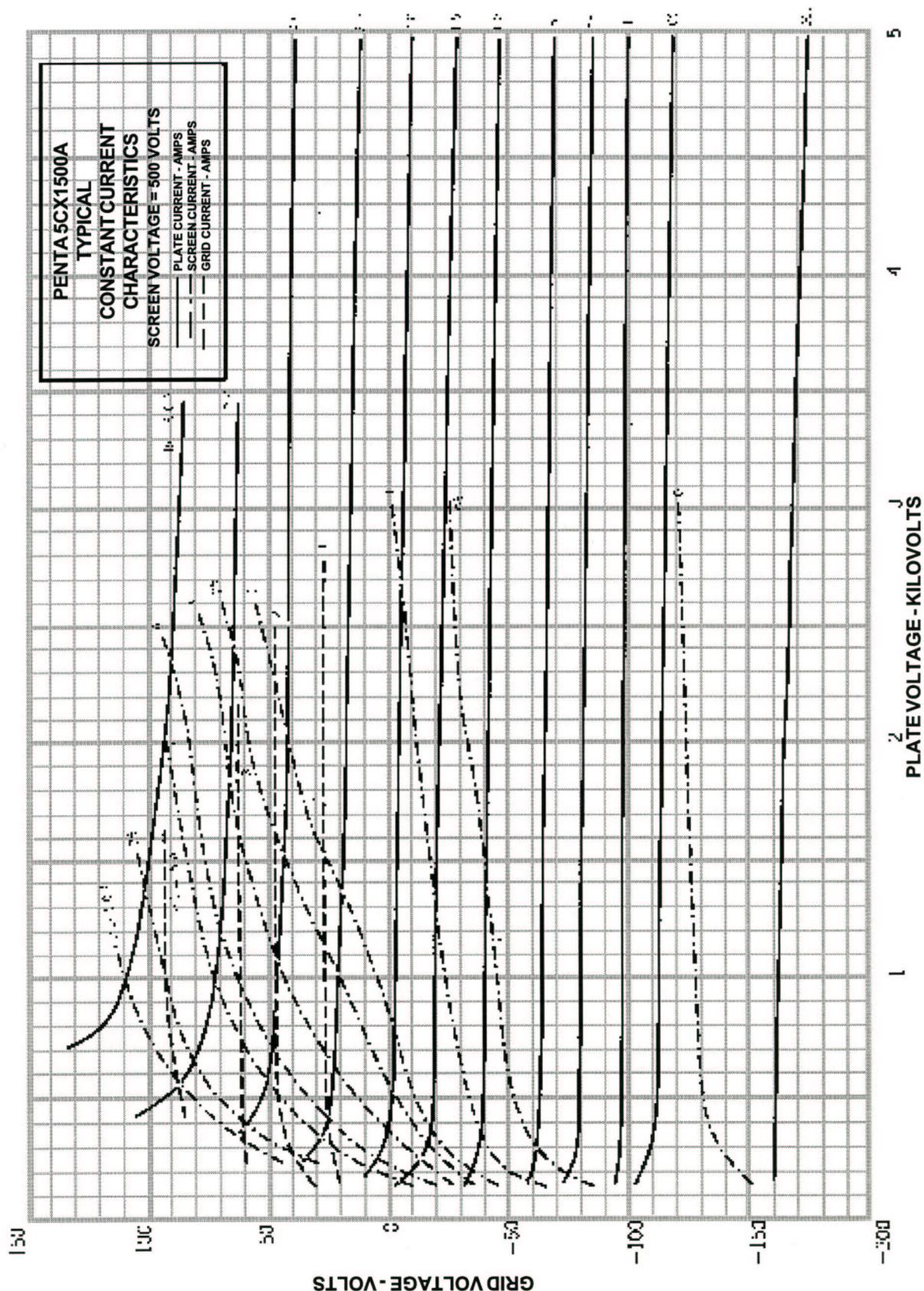


## PL5CX1500A Radial Beam Power Tetrode



Dimensions in inches		Wt. in lbs.
Part	Size	Max
A	W1	W4
a	A155	A155
B	B150	B150
C	C150	C150
D	D150	D150
E	E155	E155
F	F150	F150
G	G150	G150
H	H150	H150
I	I150	I150
J	J150	J150
K	K150	K150
L	L150	L150
M	M150	M150
N	N150	N150
O	O150	O150
P	P150	P150
Q	Q150	Q150
R	R150	R150
S	S150	S150
T	T150	T150
U	U150	U150
V	V150	V150
W	W150	W150
X	X150	X150
Y	Y150	Y150
Z	Z150	Z150
W1	W150	W150
W2	W150	W150
W3	W150	W150
W4	W150	W150
W5	W150	W150
W6	W150	W150
W7	W150	W150
W8	W150	W150
W9	W150	W150
W10	W150	W150
W11	W150	W150
W12	W150	W150
W13	W150	W150
W14	W150	W150
W15	W150	W150
W16	W150	W150
W17	W150	W150
W18	W150	W150
W19	W150	W150
W20	W150	W150
W21	W150	W150
W22	W150	W150
W23	W150	W150
W24	W150	W150
W25	W150	W150
W26	W150	W150
W27	W150	W150
W28	W150	W150
W29	W150	W150
W30	W150	W150
W31	W150	W150
W32	W150	W150
W33	W150	W150
W34	W150	W150
W35	W150	W150
W36	W150	W150
W37	W150	W150
W38	W150	W150
W39	W150	W150
W40	W150	W150
W41	W150	W150
W42	W150	W150
W43	W150	W150
W44	W150	W150
W45	W150	W150
W46	W150	W150
W47	W150	W150
W48	W150	W150
W49	W150	W150
W50	W150	W150
W51	W150	W150
W52	W150	W150
W53	W150	W150
W54	W150	W150
W55	W150	W150
W56	W150	W150
W57	W150	W150
W58	W150	W150
W59	W150	W150
W60	W150	W150
W61	W150	W150
W62	W150	W150
W63	W150	W150
W64	W150	W150
W65	W150	W150
W66	W150	W150
W67	W150	W150
W68	W150	W150
W69	W150	W150
W70	W150	W150
W71	W150	W150
W72	W150	W150
W73	W150	W150
W74	W150	W150
W75	W150	W150
W76	W150	W150
W77	W150	W150
W78	W150	W150
W79	W150	W150
W80	W150	W150
W81	W150	W150
W82	W150	W150
W83	W150	W150
W84	W150	W150
W85	W150	W150
W86	W150	W150
W87	W150	W150
W88	W150	W150
W89	W150	W150
W90	W150	W150
W91	W150	W150
W92	W150	W150
W93	W150	W150
W94	W150	W150
W95	W150	W150
W96	W150	W150
W97	W150	W150
W98	W150	W150
W99	W150	W150
W100	W150	W150
W101	W150	W150
W102	W150	W150
W103	W150	W150
W104	W150	W150
W105	W150	W150
W106	W150	W150
W107	W150	W150
W108	W150	W150
W109	W150	W150
W110	W150	W150
W111	W150	W150
W112	W150	W150
W113	W150	W150
W114	W150	W150
W115	W150	W150
W116	W150	W150
W117	W150	W150
W118	W150	W150
W119	W150	W150
W120	W150	W150
W121	W150	W150
W122	W150	W150
W123	W150	W150
W124	W150	W150
W125	W150	W150
W126	W150	W150
W127	W150	W150
W128	W150	W150
W129	W150	W150
W130	W150	W150
W131	W150	W150
W132	W150	W150
W133	W150	W150
W134	W150	W150
W135	W150	W150
W136	W150	W150
W137	W150	W150
W138	W150	W150
W139	W150	W150
W140	W150	W150
W141	W150	W150
W142	W150	W150
W143	W150	W150
W144	W150	W150
W145	W150	W150
W146	W150	W150
W147	W150	W150
W148	W150	W150
W149	W150	W150
W150	W150	W150
W151	W150	W150
W152	W150	W150
W153	W150	W150
W154	W150	W150
W155	W150	W150
W156	W150	W150
W157	W150	W150
W158	W150	W150
W159	W150	W150
W160	W150	W150
W161	W150	W150
W162	W150	W150
W163	W150	W150
W164	W150	W150
W165	W150	W150
W166	W150	W150
W167	W150	W150
W168	W150	W150
W169	W150	W150
W170	W150	W150
W171	W150	W150
W172	W150	W150
W173	W150	W150
W174	W150	W150
W175	W150	W150
W176	W150	W150
W177	W150	W150
W178	W150	W150
W179	W150	W150
W180	W150	W150
W181	W150	W150
W182	W150	W150
W183	W150	W150
W184	W150	W150
W185	W150	W150
W186	W150	W150
W187	W150	W150
W188	W150	W150
W189	W150	W150
W190	W150	W150
W191	W150	W150
W192	W150	W150
W193	W150	W150
W194	W150	W150
W195	W150	W150
W196	W150	W150
W197	W150	W150
W198	W150	W150
W199	W150	W150
W200	W150	W150
W201	W150	W150
W202	W150	W150
W203	W150	W150
W204	W150	W150
W205	W150	W150
W206	W150	W150
W207	W150	W150
W208	W150	W150
W209	W150	W150
W210	W150	W150
W211	W150	W150
W212	W150	W150
W213	W150	W150
W214	W150	W150
W215	W150	W150
W216	W150	W150
W217	W150	W150
W218	W150	W150
W219	W150	W150
W220	W150	W150
W221	W150	W150
W222	W150	W150
W223	W150	W150
W224	W150	W150
W225	W150	W150
W226	W150	W150
W227	W150	W150
W228	W150	W150
W229	W150	W150
W230	W150	W150
W231	W150	W150
W232	W150	W150
W233	W150	W150
W234	W150	W150
W235	W150	W150
W236	W150	W150
W237	W150	W150
W238	W150	W150
W239	W150	W150
W240	W150	W150
W241	W150	W150
W242	W150	W150
W243	W150	W150
W244	W150	W150
W245	W150	W150
W246	W150	W150
W247	W150	W150
W248	W150	W150
W249	W150	W150
W250	W150	W150
W251	W150	W150
W252	W150	W150
W253	W150	W150
W254	W150	W150
W255	W150	W150
W256	W150	W150
W257	W150	W150
W258	W150	W150
W259	W150	W150
W260	W150	W150
W261	W150	W150
W262	W150	W150
W263	W150	W150
W264	W150	W150
W265	W150	W150
W266	W150	W150
W267	W150	W150
W268	W150	W150
W269	W150	W150
W270	W150	W150
W271	W150	W150
W272	W150	W150
W273	W150	W150
W274	W150	W150
W275	W150	W150
W276	W150	W150
W277	W150	W150
W278	W150	W150
W279	W150	W150
W280	W150	W150
W281	W150	W150
W282	W150	W150
W283	W150	W150
W284	W150	W150
W285	W150	W150
W286	W150	W150
W287	W150	W150
W288	W150	W150
W289	W150	W150
W290	W150	W150
W291	W150	W150
W292	W150	W150
W293	W150	W150
W294	W150	W150
W295	W150	W150
W296	W150	W150
W297	W150	W150
W298	W150	W150
W299	W150	W150
W300	W150	W150
W301	W150	W150
W302	W150	W150
W303	W150	W150
W304	W150	W150
W305	W150	W150
W306	W150	W150
W307	W150	W150
W308	W150	W150
W309	W150	W150
W310	W150	W150
W311	W150	W150
W312	W150	W150
W313	W150	W150
W314	W150	W150
W315	W150	W150
W316	W150	W150
W317	W150	W150
W318	W150	W150
W319	W150	W150
W320	W150	W150
W321		

# PL5CX1500A Radial Beam Power Tetrode



# PL5CX1500A Radial Beam Power Tetrode

