Super-Power Triode

5 MW PEAK POWER OUTPUT IN LONG-PULSE SERVICE AT 440 MHz

CERAMIC-METAL SEALS — **INTEGRAL WATER DUCTS**
DOUBLE-ENDED CONSTRUCTION — **17.00 INCH MAX. LENGTH**
COAXIAL-ELECTRODE STRUCTURE — **14.125 INCH MAX. DIAMETER**

WATER COOLED

For Use as a Plate-Pulsed Amplifier at Frequencies up to 605 MHz, for Long Range Search Radar, Pulsed Transmission in Communications Service, and Particle Accelerator Service.

ELECTRICAL

Filamentary Cathode, Multistrand Thoriated Tungsten[n]—

Current (DC):		
Typical operating range value	6800 to 7200[a]	A
Maximum range value	7000 to 7400[a]	A
Maximum value for starting, even momentarily	2000	A
Minimum time to reach operating current	30	s
Minimum time at normal operating current before plate voltage is applied	60	s
Voltage (DC):[b]		
Typical range value for prescribed operating current	3.6 to 4.5	V
Maximum value under any condition	4.65	V
Direct Interelectrode Capacitances		
Grid to plate	150	pF
Grid to cathode	1600	pF
Plate to cathode	less than 1.0	pF

MECHANICAL

Operating Position	Tube axis vertical, either end up	
Overall Length	17.00 max	in
Maximum Diameter	14.125 max	in
Terminal Connections	See *Dimensional Outline*	
Weight		
Uncrated	175	lb
Crated	340	lb

THERMAL[p, q]

Ceramic-Bushing Temperature	150 max	°C
Metal-Surface Temperature	150 max	°C
Minimum Storage Temperature	-65 min	°C

Water Flow

	Typ. Flow g/m	*Absolute Min. Flow* g/m	*Pressure Differential Flow Typ. Flow*[c] psi
To plate, total flow for two parallel input and output coolant courses	160	150	45 max
To upper grid coolant course	3	2	25 max
To lower coolant course	3	2	25 max

Water Flow (cont'd)

	Typ. Flow g/m	Absolute Min. Flow g/m	Pressure Differential for Typ. Flow[c] psi	
To grid cathode coolant course	35	30	30	max
Resistivity of water at 25°C:				
Plate and grid water			1 min	MΩ-cm
Grid-cathode water			5 min	MΩ-cm
Water temperature from any outlet			70 max	°C
External gas pressure[d]			65 max	psig
Gauge pressure at any inlet[d]			90 max	psig

TERMINAL DIAGRAM (Bottom View)

FI – Filament Terminal (Inner)
FO – Filament Terminal (Outer)
KURF – Upper RF Cathode Terminal
KLRF – Lower RF Cathode Terminal
GUIRF – Upper RF Grid Input Terminal
GUORF – Upper RF Grid Output Terminal
GLIRF – Lower RF Grid Input Terminal
GLORF – Lower RF Grid Output Terminal
PLRF – Lower RF Plate Terminal
PURF – Upper RF Plate Terminal

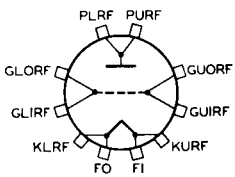


PLATE-PULSED AMPLIFIER—Class B[r]

For a maximum "ON" time[e] of 2200 microseconds in any 34000-microsecond interval

Absolute-Maximum Ratings

	Up to 450 MHz	Up to 605 MHz	
Peak Positive-Pulse Plate Voltage[f,g]	34	25	kV
Peak Negative Grid Voltage	150	150	V
Peak Plate Current	300	300	A
Peak Cathode Current[h]	600	600	A
DC Plate Current	19.5	19.5	A
DC Cathode Current	39	39	A
Plate Input (Average)	664	487	kW
Plate Dissipation (Average)	300	300	kW

Typical Operation

With rectangular wave shape in cathode-drive circuit with duty factor of 0.06 and pulse duration of 2000 microseconds

	At 440 MHz	At 550 MHz	
Peak Positive Pulse Plate-to-Grid Voltage[f,g]	30	33	20 kV
Peak Cathode-to-Grid Voltage[k]	80	60	100 V
Peak Plate Current	285	295	250 A

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

		At 440 MHz	At 550 MHz	
Peak Cathode Current[h]	570	590	500	A
DC Plate Current	17.1	17.7	15	A
DC Cathode Current	34.2	35.4	30	A
Peak Driving Power Output	170	200	225	kW
Useful Power Output at Peak of Pulse (Approx.)	4	5	2.5	MW

Absolute-Maximum Ratings

For a maximum "ON" time of 10000 microseconds in any 155000-microsecond interval

	Up to 450 MHz	
Peak Positive-Pulse Plate Voltage[f,g]	28	kV
Peak Negative Grid Voltage	150	V
Peak Plate Current	250	A
Peak Cathode Current[h]	500	A
DC Plate Current	16.25	A
DC Cathode Current	32.5	A
Plate Input (Average)	45.5	kW
Plate Dissipation (Average)	200	kW

Typical Operation

With rectangular wave shape in cathode-drive circuit at 440 MHz with duty factor[j] of 0.06 and pulse duration of 1000 microseconds

Peak Positive-Pulse Plate-to-Grid Voltage[f,g]	25	kV
Peak Cathode-to-Grid Voltage[k]	50	V
Peak Plate Current	220	A
Peak Cathode Current[h]	440	A
DC Plate Current	13.2	A
DC Cathode Current	27.4	A
Peak Driver Power Output[m]	140	kW
Useful Power Output at Peak of Pulse (Approx.)	2.5	MW

CHARACTERISTICS RANGE VALUES

	Note	Min	Max	
Input Strap-Resonant Frequency	-	90	140	MHz
Output Strap-Resonant Frequency	-	300	340	MHz
Useful Power Output	1	4	-	MW

Note 1: For conditions with filament current at prescribed typical operating value supplied with the tube, see footnote (a), peak positive-pulse plate-to-grid voltage = 32000 max. volts, peak current = 18 max. amperes, frequency = 400 to 450 MHz, pulse duration = 2000 microseconds, duty factor = 0.06, and peak pulse driving power = 220000 max. watts.

[a] The typical and maximum operating filament currents recommended for each tube are specified on a label attached to the outside diameter of the plate terminal of each tube. The specified maximum filament current for each tube is a maximum rating which should not be exceeded, even momentarily, during operation of the tube. The life of the tube can be conserved by operating the filament at the lowest current which will enable the tube to provide the desired power output. Because the filament when operated near the maximum value usually provides emission in excess of any requirements within the tube ratings, the filament current should

be reduced to a value that will give adequate but not excessive emission for any particular application. Good regulation of the filament current is, in general, economically advantageous from the viewpoint of tube life.

b Measured between KLRF and KURF (See *Terminal Diagram*).

c Measured directly across cooled element for the indicated typical flow.

d With the gauge located in an area where the maximum pressure external to the gauge is one atmosphere absolute.

e "*On*" time is defined as the sum of the duration of all individual pulses which occur during the indicated interval. *Pulse duration* is defined as the time interval between the two points on the pulse at which the instantaneous value is 50% of the peak power value. The *peak value* is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

f The magnitude of any spike on the plate voltage pulse should not exceed its peak value by more than 10%, and the duration of any spike when measured at the peak-value level should not exceed 100 microseconds. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

g Under most conditions pressurized cavities will be required for operation at the indicated typical voltages to prevent flash-over at the tube seals.

h Peak cathode current is the total of the peak plate current and the peak rectified grid current. (Pulses are not coincident, hence they cannot be added arithmetically).

j Duty factor is the product of the pulse duration and repetition rate.

k Preferably obtained from a cathode bias resistor.

m The driver stage is required to supply tube losses, rf circuit losses, and rf power added to the plate circuit. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, and in initial tube characteristics during life.

The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at the front of this section.

n See *Electrical Considerations* - Filament or Heater.

p See *Cooling Considerations* - Forced-Air Cooling.

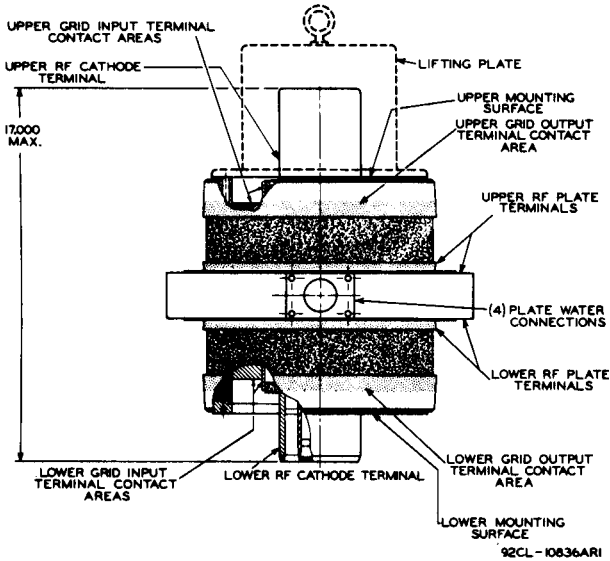
q See *Cooling Considerations* - Liquid Cooling.

r See *Classes of Service*.

FOR ADDITIONAL INFORMATION ON THIS TYPE, WRITE FOR TECHNICAL BULLETIN AND APPLICATION GUIDE FOR RCA SUPER POWER TUBES, ICE-279A AVAILABLE FROM:

Commercial Engineering
Electronic Components and Devices
Radio Corporation of America
Harrison, New Jersey

SIMPLIFIED DIMENSIONAL OUTLINE[S]



DIMENSIONS IN INCHES

[S] A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.