

# UHF TV Klystron Amplifier

- Water/Vapor Cooled
- Electromagnet Focusing
- Easy to Install and Operate
- Modulating Anode — permits both visual and aural application with a single beam supply
- High Power Output
- Very High Gain
- Long Life, High Reliability
- Integral Cavity Construction

## General Data

### Electrical:

Frequency Range	698-890 MHz
Cathode Type	Indirectly heated, tungsten-dispenser cathode
Heater (dc or 50-60 Hz):	
Voltage <sup>a</sup>	6.0 ± 0.5 V
Current @ 6.0 V, typical	16.4 A
Surge current, maximum	30.0 A
Warm-up time, minimum	180 sec
Focusing	RCA-AJ2168 Electromagnet

### Mechanical:

Mounting Position	Vertical, cathode down
Dimensions, Maximum:	
Height	(1165 mm) 45.9 in
Width (excluding output connector)	(330 mm) 13.0 in
Weight, Approximate:	
Uncrated	(81.6 kg) 180 lbs
Crated	(204 kg) 450 lbs
Inlet Coolant Connector	Mates with Hansen LL3-H21
Outlet Coolant Connector	Mates with Hansen LL6-H31
Steam Outlet	See Dimensional Outline

### Electrical Connections:

RF Input	UG-22B/U jack mates with UG-21D/U plug
RF Output	See Dimensional Outline
Collector <sup>b</sup>	Pins F and G, Cannon Rec. <sup>c</sup>
Thermocouple:	
Chromel	Pin H Cannon Rec. <sup>c</sup>
Alumel	Pin J Cannon Rec. <sup>c</sup>

Body .....	Pin E Cannon Rec. <sup>c</sup>
Modulating Anode .....	See Dimensional Outline
Heater-Cathode .....	See Dimensional Outline
Heater .....	See Dimensional Outline
Interlock No.1 .....	Pins A and B, Cannon Rec. <sup>c</sup>
Interlock No.2 .....	Pins C and D, Cannon Rec. <sup>c</sup>

**Thermal:**

Collector Temp. (max.) .....	145 °C
Body Temperature (max.) .....	100 °C
Electron Gun Insulator Temp. (max.) .....	250 °C
Storage Temp. <sup>d</sup> (min.) .....	-65 °C

**Coolant Requirements:****Collector and Body**

Water flow (min.) .....	(0.125 l/s) 2.0 gpm
Inlet water temperature (max.) .....	70 °C

**Electron Gun**

Forced air flow <sup>e</sup> (min.) .....	(24 l/s) 50 cfm
Water Pressure Differential for Typical Flow of 2.1 gpm (max.) .....	$\left\{ \begin{array}{l} 3.5 \text{ kg/cm}^2 \\ 50 \text{ psi} \end{array} \right.$
Water Pressure at any Inlet (max.) .....	

**Maximum Ratings, Absolute-Maximum Values**

Beam Voltage, DC .....	20 max.	kV
Beam Current, DC .....	5.5 max.	A
Body Current, DC .....	250 max.	mA
Modulating Anode Voltage, DC .....	20 max.	kV
Load VSWR .....	1.5:1.0	

**Typical Operation, UHF Television Service****(Visual 699.25 MHz, Aural 703.75 MHz)**

	Visual	Aural	
Collector Voltage, DC <sup>f</sup> .....	0	0	V
Body Voltage, DC .....	0	0	V
Beam Current, DC .....	4.7	2.4	A
Body Current, DC <sup>g</sup> .....	70	15	mA
Modulating Anode Voltage, DC .....	0	-6	kV
Modulating Anode Current, DC .....	1.5	1.0	mA
Cathode Voltage, DC .....	-18	-18	kV

Focusing Current, DC (Typical With RCA-AJ2168 Electromagnet) . . . . .	28	28	A
Load VSWR . . . . .	1.1:1	1.1:1	-
Drive Power for Visual Peak-of- Sync or Aural CW . . . . .	10	1.1	W
Output, for Visual Peak-of-Sync or Aural CW . . . . .	31	12	kW
Gain . . . . .	35	40	dB
Efficiency . . . . .	37	28	%

- a Careful attention to maintaining the minimum value of filament voltage consistent with adequate emission will result in conserving the life of the tube.
- b Pins F and G must always be used in parallel.
- c Type CA22365-2729 Cannon Receptacle.
- d All water must be removed from the coolant course during storage and shipping.
- e Cooling-air blower must be directed toward the electron gun and located within a distance of 24 inches.
- f A dc ammeter makes the connection between the collector and ground.
- g The body is connected directly to ground. Body current is measured in the ground leg of the beam power supply.

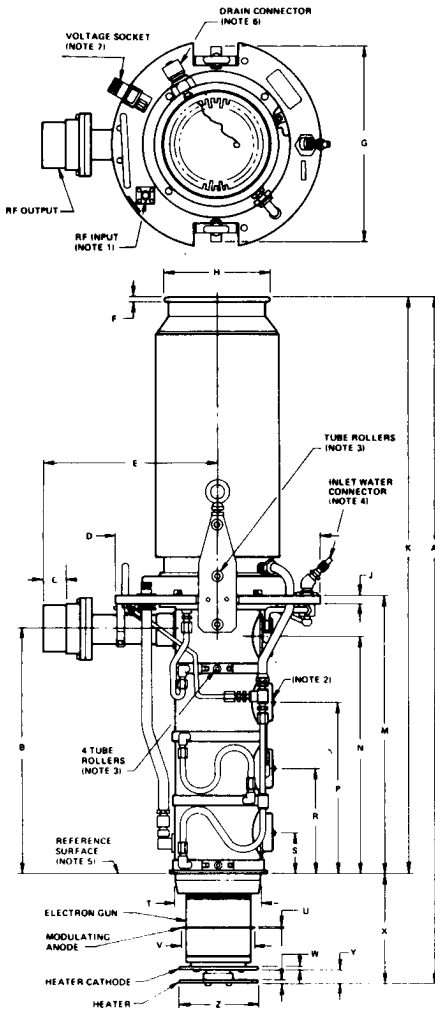
### Operating Considerations

Typical operating coil currents are noted under "Typical Operation" data section in this data sheet.

It is recommended that the coil coolant flow start before the application of any coil voltage and preferably continue for five minutes after the removal of voltages. Interlocking of the coolant flow with the klystron beam and modulating-anode voltages and coil voltages is highly recommended to prevent tube and coil damage in the event of inadequate coolant flow.

The use of a solid-state diode connected in parallel with the electromagnet is recommended to prevent excessive transient voltage build-up in the event of coil current interruptions. Connections should be made so the coil current will flow through the diode when the polarity of the normal coil voltage becomes reversed.

## Dimensional Outline – Klystron



92LL 3827

## Pin Connections – Voltage Socket

A } Jumpered	F Collector*
B } Jumpered	G Collector*
C } Jumpered	H Thermocouple (Chromel)
D } Jumpered	J Thermocouple (Alumel)
E Body (Ground)	*Always use pins F and G in parallel.

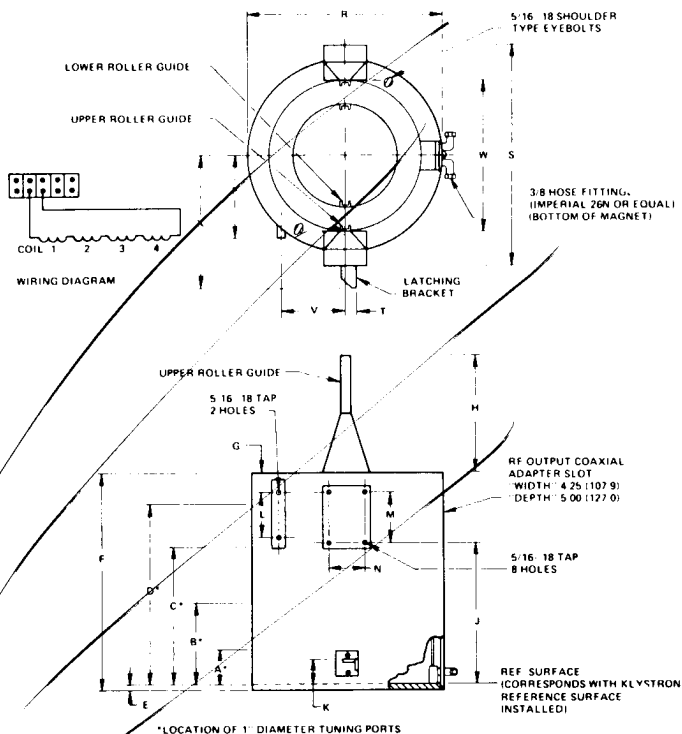
## Tabulated Dimensions for Klystron

Dim.	Value – Inches	Value – Millimeters
A	45.56 ± .32	1157 ± 8
B	16.33 ± .06	414.8 ± 1.5
C	1.50 ± .01	38.10 ± .25
D	13.00 Max.	330.2 Max.
E	11.00 ± .12	279.4 ± 3.0
F	0.23 ± .04	5.8 ± 1.0
G	12.40 Max.	315.0 Max.
H	6.40 ± .04	162.6 ± 1.0
J	0.50 ± .02	12.70 ± .51
K	38.67 ± .25	982.2 ± 6.4
M	18.66 ± .08	474.0 ± 2.0
N	15.74 ± .06	399.8 ± 1.5
P	11.50 ± .05	292.1 ± 1.3
R	7.15 ± .04	181.6 ± 1.0
S	2.82 ± .03	72.4 ± .8
T	5.76 Max.	14.63 Max.
U	0.04 Ref.	1.0 Ref.
V	5.00 ± .01	127.00 ± .25
W	0.19 ± .01	4.83 ± .25
X	6.89 ± .07	175.0 ± 1.8
Y	0.69 ± .05	17.5 ± 1.3
Z	5.00 ± .03	127.0 ± .8

## Notes:

1. RF Input Jack, UG-22 B/U mates with UG-21 D/U.
2. Channel tuning screws. These screws have a 5/16 inch hex socket head.
3. Tube rollers mate with roller guides in the RCA AJ2168 Electromagnet.
4. Inlet Water Connector mates with Hansen LL3-H21 Connector.
5. Reference Surface corresponds with electromagnet reference surface when installed.
6. Drain Connector mates with Hansen LL6-H32 Connector.
7. Cannon Receptacle CA22365-2729. Mates with Cannon Plug 24-20.

## Dimensional Outline – Electromagnet



92LM 3823

## Personnel Safety

The high voltages and microwave radiations from this device can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals adequately shielded. This device, in operation, may produce X-radiation which can constitute a health hazard. Shielding or other precautions may be required.

## Tabulated Dimensions for Electromagnet

Dim.	Value - Inches	Value - Millimeters
A	2.87 $\pm$ .03	72.9 $\pm$ .8
B	7.25 $\pm$ .03	184.2 $\pm$ .8
C	11.60 $\pm$ .03	294.6 $\pm$ .8
D	15.79 $\pm$ .03	401.1 $\pm$ .8
E	0.50 $\pm$ .02	12.7 $\pm$ .5
F	19.28 $\pm$ .05	489.7 $\pm$ 1.3
G	1.76 $\pm$ .06	44.7 $\pm$ 1.5
H	10.00 $\pm$ .03	254.0 $\pm$ .8
J	12.79 $\pm$ .03	324.9 $\pm$ .8
K	3.16 $\pm$ .06	80.3 $\pm$ 1.5
L	4.00 $\pm$ .03	101.6 $\pm$ .8
M	4.50 $\pm$ .03	114.3 $\pm$ .8
N	3.00 $\pm$ .03	76.2 $\pm$ .8
P	7.00 $\pm$ .03	177.8 $\pm$ .8
R	16.00 $\pm$ .03	406.4 $\pm$ .8
S	17.00 Max.	431.8 Max.
T	1.00 $\pm$ .03	25.4 $\pm$ .8
V	5.60 $\pm$ .03	142.2 $\pm$ .8
W	12.80 $\pm$ .05	325.1 $\pm$ 1.3
X	10.68 $\pm$ .05	271.3 $\pm$ 1.3

## General Information

## Cooling

The electron gun is cooled by forced air directed at the cathode-seal area. Air flow must be at least 50 cfm. (24.0 l/sec). The remainder of the tube is cooled by water/vapor system with water cooling the resonators and drift-tube sections and vapor cooling the collector.

The use of distilled water is essential. The liquid flow must start before application of any voltages and preferably should continue for five minutes after removal of voltages. It is recommended that the liquid flow through each of the cooled elements be interlocked with the beam supply to prevent damage to the tube in case of cooling failure.

A steam exhaust sleeve must be provided for the top of the klystron boiler. A flexible, neoprene type is recommended.

The sleeve is placed over the lip provided at the top of the boiler (see Dimensional Outline) and clamped securely in place for a water-tight connection.

### Electrical Connections to Tube Terminals

Connections to the Heater, Heater-Cathode and Modulating Anode Terminals (see Dimensional Outline) are made with preformed finger stock or knife blade type fuse clips. Care should be taken when making these connections not to place excessive stress on the ceramic-to-metal seals.

### Protection Circuits

Protection circuits serve a threefold purpose: safety of personnel, protection of the tube and protection of tube circuits. Consult Application Note AN4206 for complete information on protection circuits required.

A means of protecting the klystron against damage which would result from failure of the collector vapor cooling system is provided by an integral chromel-alumel thermocouple with terminals at the Cannon Receptacle.

### RCA AJ2168 Electromagnet

The RCA 8826 klystron is designed to be mounted in and its beam focused by the water-cooled, single-coil electromagnet, RCA-AJ2168. The exposed surfaces of the electromagnet are treated by painting or plating to resist corrosion.

#### General Data

Voltage, DC (max.)	35	V						
Current, DC (max.)	30	A						
Dimensions	See Dimensional Outline							
Weight (Approx.)	<table> <tbody> <tr> <td>Uncrated (104 kg)</td> <td>230</td> <td>lbs</td> </tr> <tr> <td>Crated (145 kg)</td> <td>320</td> <td>lbs</td> </tr> </tbody> </table>		Uncrated (104 kg)	230	lbs	Crated (145 kg)	320	lbs
Uncrated (104 kg)	230	lbs						
Crated (145 kg)	320	lbs						
Cooling:								
Water flow, minimum	(0.063 l/s)	1 gpm						
Inlet temperature, maximum	70°	C						
Maximum water pressure differential for typical flow (gauge)	(3.5 kg/cm <sup>2</sup> )	50 psi						
Maximum water pressure at any inlet (gauge)	(4.2 kg/cm <sup>2</sup> )	60 psi						